PB-212 398

RURAL STORAGE AND COLLECTION CONTAINER SYSTEMS

Humboldt County Department of Public Works

Prepared for:

Environmental Protection Agency

1972

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EPA-SW-41D.I-72

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RURAL STORAGE AND COLLECTION CONTAINER SYSTEMS

This interim report (SW-41d.i) on work performed under
solid waste management demonstration grant no. G06-EC-00271
was written by
HUMBOLDT COUNTY, CALIFORNIA, DEPARTMENT OF PUBLIC WORKS and
GARRETSON-ELMENDORF-ZINOV-REIBIN, CONSULTANTS
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BIBLIOGRAPHIC DATA SHEET

1. Report No. EPA-SW-41D.I-72

2.

3. Recipient's Accession No. PB-212 398

4. Title and Subtitle

Rural Storage and Collection Container Systems.

5. Report Date 1972

6.

7. Author(s) Humboldt County, California, Department of Public Works and Garretson-Elmendorf-Zinov-Reibin, Consultants

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

Humboldt County, California
Department of Public Works
Eureka, California

10. Project/Task/Work Unit No.

11. XXXXXXXX/Grant No. G06-EC-00271

12. Sponsoring Organization Name and Address

U.S. Environmental Protection Agency
Office of Solid Waste Management Programs
Washington, D. C. 20460

13. Type of Report & Period Covered Interim 6/1/70 - 10/31/71

14.

15. Supplementary Notes

16. Abstracts The objective of this project is to demonstrate and evaluate two alternative storage and collection container systems for small isolated rural areas, with special emphasis on costs, workability, and community acceptance. The test area for the project is the southern one-third of Humboldt County, California, with a population of approximately 10,000 people. The area is divided in half, and one system will be instituted in each half. Both systems will provide an access ramp for vehicles and will test two container heights, one level with the ramp and the other elevated 2-1/2 feet. In the first system, waste will be deposited in a 40-cu-yd, roll-off type container that can be picked up and hauled to the central sanitary landfill. In the second system, waste will be deposited in 8-cu-yd containers. These containers will be emptied at the site into a 42-cu-yd collection vehicle that will then proceed to the next container site or, if full, to the landfill. This interim report details (1) the selection of collection equipment (both containers and vehicles) components, and (2) the development of test procedures for evaluating the storage and collection systems.

17. Key Words and Document Analysis. 17a. Descriptors

*Refuse disposal, Rural areas, Collection, Storage, Containers, Equipment Specifications

17b. Identifiers/Open-Ended Terms

*Solid waste management, Humboldt County (Eureka, California)

17c. COSATI Field/Group 13B

18. Availability Statement

Release to public

19. Security Class (This Report) UNCLASSIFIED

20. Security Class (This Page) UNCLASSIFIED

21. No. of Pages 155

22. Price $3.00

FORM NTIS-35 (10-70)

USCOMM-DC 40329-P71

This report has been reviewed by the U.S. Environmental Protection Agency and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency nor does mention of commercial products constitute endorsement or recommendation for use by the U.S. Government.

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RURAL STORAGE AND COLLECTION CONTAINER SYSTEMS

INTRODUCTION

In recognition of the need for rural communities to upgrade their existing disposal facilities and eliminate the numerous open burning dumps, the County of Humboldt has undertaken a phased development program leading towards the establishment of an integrated solid waste storage, collection, and disposal system for the rural and isolated areas of the county. The program has been a cooperative effort between the County of Humboldt, California State Department of Public Health, California State Department of Parks and Recreation, and the California State Division of Forestry. The Environmental Protection Agency* has provided financial assistance, and Garretson-Elmendorf-Zinov-Reibin, Architects and Engineers, have provided technical guidance. An advisory committee including representatives from the above organizations and civic groups has proved to be a key in guiding and reviewing the staff's efforts to insure the development of an effective and well coordinated program.

The county's basic goal has been to prove the technical and economic feasibility of establishing a countywide system of solid waste disposal using containerized storage and collection facilities combined with centrally located sanitary landfills. Under this concept, the county would eliminate the existing 20 or more small open dumps and replace them with containerized bins or units designed to allow the public to dump directly into the units. These containers would then be removed at weekly, or more frequent intervals, and replaced with an empty container. The containers would be hauled to the central landfill serving that area.

Some of the more direct benefits expected are: (1) reduced fire hazard to surrounding forests; (2) reduced sanitary hazards, such as flies and rodents; (3) elimination of water pollution; (4) greater convenience to the public (container stations would be placed closer to population areas and roads and in locations not presently served by disposal sites); (5) elimination of nuisances from smoke, odors, and unsightliness (stations would be screened and landscaped); and (6) ultimate disposal in sanitary landfills which are not now feasible due to insufficient volumes.

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*Office of Solid Waste Management Programs

The development of such an economical and technically sound containerized collection system was broken into three distinct phases. Phase I was a feasibility study consisting of an analysis of the problem, identification of the environmental criteria, the development of alternate system plans, evaluation of costs and performance, and selection and detailed analysis of recommended plan. It was completed in January 1970 and the county has now embarked on the construction and implementation of the recommended system in a limited test area to review and evaluate its performance with regard to the technical, economic, health, aesthetic, fire, and environmental factors. If Phase II confirms its economic viability, the county will implement the system throughout its remaining rural areas in the third and last phase. This report describes the design, selection, award and purchase of the containerized collection systems and related components.

SYNOPSIS - FEASIBILITY STUDY (PHASE I)

To provide the reader a sufficient background to evaluate and ascertain the effectiveness of the procedures and designs employed in implementing the rural area collection system, a summary of the basic problem, previous investigations, and alternative concepts evaluated is presented below. This synopsis is based on the Humboldt County Public Works Department report, Solid Waste Disposal for Rural Communities-1970, which was prepared with the assistance of the California State Department of Public Health and the consulting firm of Garretson-Elmendorf-Zinov-Reibin, and the California Vector Views, Volume 17, Number 7, July 1970, "Solid Waste Transfer and Disposal for Rural Areas" by Donald R. Andres, California State Department of Public Health, and Fred W. Cope, Humboldt County Department of Public Works. The study was partially supported by Demonstration Grant Number G06-EC-00138 from the Office of Solid Waste Management Programs, U.S. Environmental Protection Agency.

Overview

In California as well as throughout the Nation, the problems associated with the disposal of solid wastes have reached critical proportions. The National Solid Waste Act of 1965 has stimulated a great deal of effort towards planning and the development of technology. Advances are being made in fields of incineration, composting, and sophisticated equipment development which will be invaluable in the future.

At the present time almost all of the current effort to achieve technological advances is being expended to combat urban and semiurban solid waste problems. This is understandable, inasmuch as these areas present the most significant problems in terms of volume of material and affected population. It is a fact, however, that many of the small rural or mountain communities and recreation areas are also faced with significant solid waste problems. While these problems are of a different scale and magnitude than those presented by urban areas, they are nevertheless real and of major concern to local officials.

Little attention has been directed to solving the problems of solid waste disposal in the rural and mountain communities. What is specifically needed is a management system to eliminate the use of open burning dumps which are a source of health and fire hazards and also a source of air, water, and land pollution. Implementation of conventional alternatives is severely hampered due to the difficulty of adapting them to rural areas and the high initial cost of such systems.

Existing Conditions

Humboldt County, like many counties in California, has assumed the responsibility of providing solid waste disposal sites for most of the unincorporated areas of the county. The population of Humboldt County is 106,000, with 87 percent of the population living within franchised collection areas. The remaining 14,000 people, or 13 percent of the population, live in small communities located throughout the county.

Within Humboldt County are six major State parks, one major highway, numerous recreational areas and camping grounds, and one large subdivision at Shelter Cove. The region is typical of the coastal forests prevalent in Northern California, Oregon, and Washington—viz., transportation systems, geologic and atmospheric conditions, population distribution and economic dependency on the forestry resources.

Quantities of waste requiring disposal in the county were estimated to be 61,900 tons per year, with an expected 91,800 tons per year in 1985. At the present time, over 27 disposal sites are in operation in the county. With one or two exceptions, all of these sites can be generally categorized as open dumps. Under the present system, the county attempts to maintain these sites on an intermittent basis. Financial, manpower, and equipment constraints, however, limit the county's ability to adequately service the disposal sites; consequently, the current disposal situation (typical of most rural counties) results in dump sites which present severe fire hazards, fly and rodent infestations, smoke and odors, surface water pollution, and aesthetic blight.

Alternative Concepts

To achieve the desired results, various alternative concepts were considered. These included: incineration, composting, pyrolysis, extension of house-to-house collection, local disposal sites, central sanitary landfills, and containerized storage and transfer facilities.

The specific criteria used by the Advisory Committee in conceptualizing the viable alternatives were that: (1) the minimum acceptable level of service to the small rural communities, which did not have the benefit of a regular collection system, was access to local disposal sites located not more than 8 miles from the rural population centers and preferably closer; (2) the minimum acceptable standards for operating any land disposal site are defined as those pertaining to a modified landfill;* and (3) the costs for financing and operating the system be within the realm of those projects feasible for a rural entity, such as Humboldt County. The criteria were established by the Advisory Committee on the basis of (1) terrain and travel times; (2) public health factors; (3) public acceptance and aesthetics; and (4) specialized local conditions.

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*Solid waste disposal operations which do not meet sanitary landfill standards are not considered proper disposal facilities by the U.S. Environmental Protection Agency.

In reviewing these alternatives, it was readily ascertained that incineration, composting, and pyrolysis were infeasible for rural areas on the basis of their operating characteristics and published cost figures. Although routine collection of refuse from the home is considered to be the best method for maintaining a sanitary environment in the community, extension of the existing urban or semiurban collection services to the rural resident was also judged to be impractical because of the exceedingly low population densities, condition of the roads and travel times.

Only three systems were considered to be potentially effective and practical for rural areas: (1) modified landfills dispersed throughout the county and covered on a weekly basis by mobile crews; (2) container sites utilizing 8-cubic-yard bins for storage and compaction type collection vehicles for transportation to the central sanitary landfill site; and (3) container sites utilizing 40-cubic-yard bins for storage and transfer to the central sanitary landfill in an uncompacted state.

Salient Features

The modified landfill system has low initial cost and virtually unlimited capacity, constrained only by the total acreage and availability of cover material. A landfill site in a suitable location can effectively dispose of all types of solid waste at a low initial cost.

The disadvantages of a modified landfill are that since it is not maintained and covered daily, there are problems of environmental pollution, an aesthetically unpleasant appearance, fire hazards, supervisory problems, and little, if any, effective compaction. In forested regions there are additional problems in locating suitable land, constructing access roads, and operating and maintaining the system.

In the containerized concept, the service for a container must be provided by equipment that can either empty the contents of the container into a collection vehicle or transport the container and its contents to a disposal site.

The large-sized container system consists of a truck equipped with a special carriage which allows the loading and unloading of the 40-cubic-yard containers. The containers are filled with waste at the rural disposal site and transported to the central sanitary landfill in a loose, bulky state.

The waste within small-sized containers (8-cubic-yard) may be unloaded into a truck with a compaction unit. In utilizing this method, a truck may service many containers using the compaction equipment on the vehicle to reduce the volume of waste picked up. In this manner the truck would not have to return to the disposal site after servicing a single container disposal facility.

The container system, either large or small, has the advantage of gaining public acceptance by reducing environmental problems, fire hazards, and affording easy access. The operational flexibility, minimal personnel requirements, and physical size of the site require a relatively low annual operating cost.

The disadvantages of the system are the high initial cost and the limited type of solid waste than can be processed through the container openings. The container system does have definite capital costs, but these costs are highly dependent on the site configuration. A primary difference between the 8 and the 40-cubic-yard systems is that the collection time for the large 40-cubic-yard container system is more sensitive to an increase in generated volumes than the 8-cubic-yard container system. When the volume of refuse per service interval exceeds the 40-cubic-yard system capacity, servicing requires an additional round trip. The 8-cubic-yard system can be adjusted by both route frequency and number of containers placed at sites on the specific route. The 40-cubic-yard container system, on the other hand, offers substantially more flexibility for all types of solid waste.

Comparison of Alternative Systems

To provide a basis for evaluating the alternatives, certain criteria were considered:

(1) The initial cost of land acquisition, site preparation, and equipment should be determined on an amortized basis, and the annual operating cost of each alternative system estimated.

(2) Population increases and new development may dictate a need for expanding existing sites or creating new ones. The initial system and equipment chosen should be flexible enough to incorporate modification or expansion.

(3) Disposal sites should be located near public roads to minimize the cost of access roads. The terrain at the site should preclude costly excavation or embankment construction, and attention should be given to the general soil type and stability at each site.

(4) The disposal and container sites should be located and designed to be as aesthetically pleasing as practical and to create as little environmental degradation as possible.

(5) Personnel requirements for operating and maintaining the system should be considered. The equipment selected and site design should be such that the operator will be able to perform routine site maintenance without additional help.

(6) Some types of transport vehicles (container or landfill equipment) may be utilized for additional functions. such as snow removal, general hauling, and debris collection. Consideration of additional useful functions should be made when selecting equipment.

(7) Transport vehicle (container or landfill equipment) travel requirements will affect the operating cost. The type of system selected should provide the desired level of service with a minimum of travel time and maintenance and operation expense.

(8) Solid waste containers and transport vehicles should be designed to facilitate cleaning with a minimum of equipment and effort. Containers and loading facilities which will allow minimum spillage at the container sites should also be selected.

To facilitate the evaluation and implementation of the alternative concepts, the county was divided into four planned service areas (Figure 1). While all of these service areas will be evaluated in the development of the countywide plan, Area I has been selected for an extensive in-depth analysis, as it is an ideal test area typical of the isolated rural community for which this project was conceived. Some of the more critical disposal problems occur in this area which comprises primarily the southerly third of Humboldt County. It contains 16 unincorporated communities, ranging in size from 150 to 1,100 persons. The approximate total population for this area is 10,000 and it is presently serviced by 11 open dumps. Also located in this area are three State parks and one major highway.

The modified landfill system, the 8-cubic-yard container system, and the 40-cubic-yard container system were designed to the extent necessary to get reliable cost and operational figures. Collection routes were selected and theoretical schedules stipulated. Land acquisition, site preparation, and equipment costs were estimated and six different site designs were developed for the containerized collection system. The comparison was based upon equipment requirements, access requirements, public usage factors, space limitations, compatibility with containers, and initial costs. Personnel requirements for operating and maintaining the system were estimated. An economic comparison was made of each system, including capital, operational, and replacement costs.

Modified Landfill System. Modified landfill sites could not be constructed and maintained at the locations considered for containerized disposal facilities. It would be necessary to acquire additional land to develop new permanent landfills.

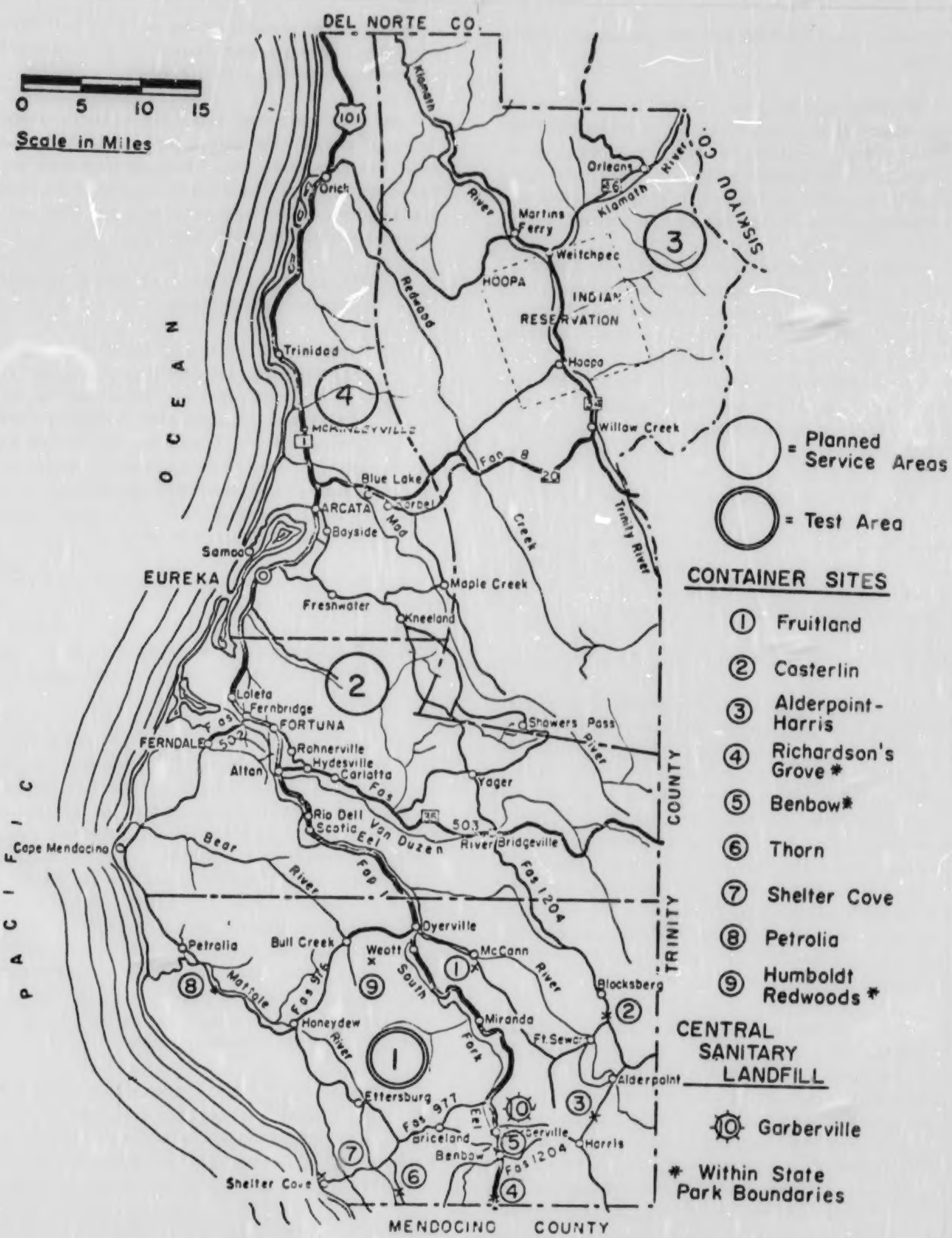

DEL NORTE CO.
0 5 10 15
Scale in Miles
PACIFIC OCEAN
SISKIYOU CO.
TRINITY COUNTY
MENDOCINO COUNTY
101
Orick
Trinidad
McKINLEYVILLE
Blue Lake
ARCATA
Korbel
Bayside
Samoa
EUREKA
Freshwater
Kneeland
Maple Creek
Loleta
Fernbridge
FORTUNA
FERNDALE
Rohnerville
Hydesville
Carlotta
Alton
Rio Dell
Scotia
Yager
Bridgeville
Showers Pass
Cape Mendocino
Petrolia
Bull Creek
Weott
Dyerville
McCann
Blocksburg
Honeydew
Miranda
Ft. Seward
Alderpoint
Ettersburg
Briceland
Garberville
Benbow
Harris
Shelter Cove
Orleans
Martins Ferry
Weitchpec
HOOPA INDIAN RESERVATION
Hoopa
Willow Creek
Klamath River
Redwood Creek
Trinity River
Mad River
Bear River
Van Duzen River
Eel River
South Fork Eel
Mattole River
Fas 8
Fas 504
Fas 503
Fas 1204
Fas 916
Fas 977
Fap 1
96
299
36
1
2
3
4
= Planned Service Areas
= Test Area
CONTAINER SITES
① Fruitland
② Casterlin
③ Alderpoint-Harris
④ Richardson's Grove *
⑤ Benbow*
⑥ Thorn
⑦ Shelter Cove
⑧ Petrolia
⑨ Humboldt Redwoods *
CENTRAL SANITARY LANDFILL
⑩ Garberville
* Within State Park Boundaries

Figure 1. Map of Humboldt County showing planned solid waste service areas and location of container sites and sanitary landfill in Area I.

The operational cost of the landfill system was based upon a schedule to provide coverage on a weekly basis by mobile crews. More frequent maintenance due to environmental problems were considered likely but was not included in the above annual operational cost.

Although the modified landfill sites could be expanded, they are permanently located and therefore do not afford the flexibility inherent in a containerized system. If new development or seasonal fluctuations required additional sites in a more convenient location, a modified landfill development would be much more expensive than establishing or relocating a containerized facility.

It must be emphasized that a system of modified landfills is not sanitary, as a sanitary landfill has to be maintained and covered daily. The modified landfill system was found to be more costly than the two containerized systems.

Forty-Cubic-Yard Container System. Three types of site developments were considered for the large container system. All sites utilized a concrete retaining wall for the bin area. Type I was developed with a separate turn-around area for the collection truck and provided space for two bins. Type II provided space for only one bin without a turn-around area. The collection vehicle would be required to back into the bin area. Type III utilized a mechanical device to lift and dump the bin contents into the collection vehicle; the vehicle would utilize the access road for the resident.

The recommended container site (Type II) consists of a ramp and paved dumping area for the residents, a separate access road for the container transport truck, and a concrete slab capable of supporting a 40-cubic-yard container (Figure 2). The dumping area is on a fill approximately level with the top of the container, 8 feet above the elevation of the truck loading area. An 8-foot-high concrete retaining wall acts as a support for the vertical face of the fill. The container area may be enclosed with a 20-foot-high wire fence that prevents the dumped wastes from blowing or burning materials escaping from accidental fires. The paving consists of asphalted concrete over supporting base.

The residents may use this site by simply driving up the ramp and unloading solid waste into the container (Figure 3). The dumping platform area has been designed to allow the residents ample space to maneuver and turn around. The maintenance procedure involves: (1) the arrival of the truck with an empty container at the site; (2) pulling or dragging of the loaded container to the farthest position from the disposal area (this can be accomplished by a special hydraulic arm placed on the front of the truck and using containers having permanently attached rollers; the extra cost of unloading area with two stalls was determined to be too great); (3) unloading the empty container into the stall; (4) loading the full container onto the transport truck and policing the site.

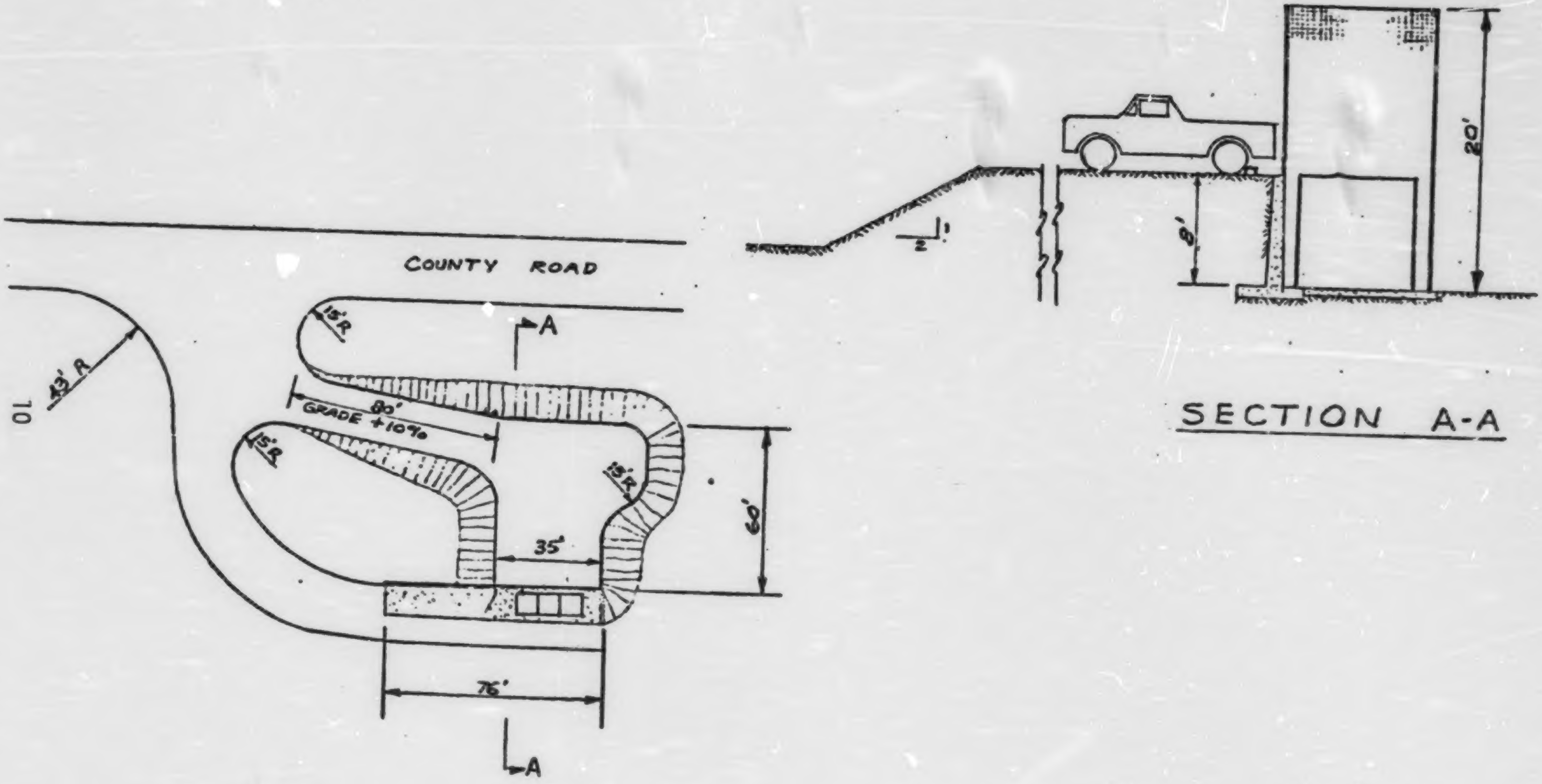

COUNTY ROAD
15'R
15'R
15'R
43'R
A
A
80'
GRADE +10%
35'
60'
76'
2
1
8'
20'
SECTION A-A

Figure 2. Type II container site plan.

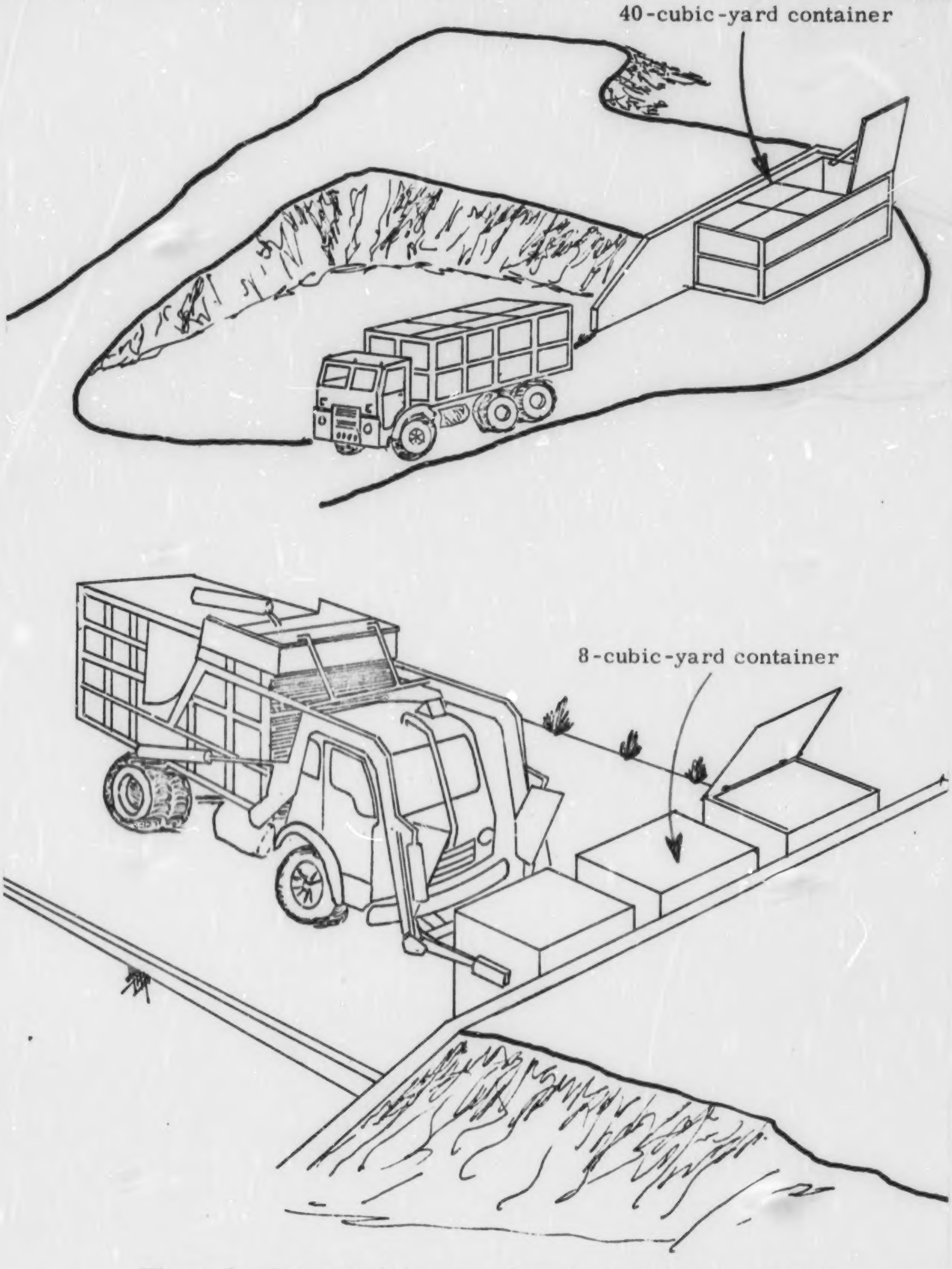

40-cubic-yard container
8-cubic-yard container

Figure 3. Conceptual drawing of truck, containers, and site for utilizing the 8- and the 40-cubic-yard container systems.

In utilizing this method, solid waste will be transported to the central disposal site in a loose, bulky state. This system has the advantage of providing a potential multipurpose unit. During times when the vehicle was not in service transporting waste, another type of box, such as a dump-box, could be used. In this manner, if two of these vehicles were available, one vehicle could be used to service the containerized disposal facilities, and the other could be used in other public works projects. The second vehicle would then be available for emergency replacement of the regular solid waste transport vehicle.

Although the Type III container system was found to be less costly than the Type II noted above, its operational characteristics, with a mechanical lifting device, were determined undesirable.

Eight-Cubic-Yard Container System. Three types of site developments were considered for the small-size containers. All sites again utilized a concrete retaining wall for the bin area. Type IV was designed with the top of the bins 3 feet above the approach ramp so the collection vehicle could service the bins from the dumping area. Types V and VI were designed with the top of the bins level with the dumping area, requiring development of a collection vehicle access road to the back of the bin area. Each system is equipped with a number of 8-cubic-yard containers, reinforced concrete retaining wall, a paved dumping area, a concrete slab, and a wire fence enclosure. Each container has channels welded along the side and within 1 foot of the top for the forks of the collection vehicle.

In utilizing this system the containers are emptied into a front-loading compaction truck (Figure 3). The collection vehicle can service many containers, as the compaction equipment on the vehicle reduces the volume of wastes picked up. In this manner the vehicle would not have to return to the disposal site after servicing a single container disposal facility. As an 8-cubic-yard container is the largest size capable of being dumped into the compactor vehicle, a sufficient number of containers must be placed at each site to handle the amount of wastes received. Attention must be given to directing the public to utilize the empty containers as some of the containers fill up. Large items would also have to be placed in containers with sufficient volume remaining to contain the entire material. The compaction unit in this system is a more specialized piece of equipment; other applications would be quite limited.

The maintenance procedure at the container sites involves: (1) positioning the truck and engaging hydraulically-operated lift forks in channels welded to the container sides; (2) lifting the container and dumping its contents into the truck hopper; (3) cleaning the container and discharging the effluent into the truck; (4) lowering the container back to its original position and activating the compaction mechanism; (5) repeating the process for all loaded containers; (6) policing the site.

Summary and Conclusions

In reviewing the results of the feasibility study, the following conclusions can be made: (1) individual community disposal sites with weekly maintenance have a higher annual cost than the container system; however, the container system has a higher initial cost due to capital costs (Table 1); (2) the capital cost of a bin disposal site is dependent on the relative elevation difference between the dumping level and the truck loading area and the length of the retaining wall; (3) with the same frequency of maintenance the containerized system reduces or eliminates environmental problems to a greater extent than the modified landfill disposal system; (4) the evaluation of the different container systems is difficult because of a number of indirect benefits and costs associated with each of the two basic systems.

The modified landfills have the advantage of a virtually unlimited capability to receive wastes of any size or configuration while the containers are inherently limited to types of solid wastes which can pass through the openings. When the quantity increases, the containers may be emptied more frequently or extra containers are provided. The containerized wastes should not present as severe environmental problems as unattended landfills and consequently may be located near existing roads and reduce access costs. Because the location of the container site is not as dependent on topography, soil characteristics, drainage and ground water conditions, and fire hazards as a landfill site, it should be easier to establish.

The feasibility study indicated that, with weekly maintenance, there is an apparent economic advantage to the containerized system compared to the modified landfill system. Likewise, the location of container stations may afford greater convenience to the public than remote landfills.

The container station configuration, size of container, collection vehicle, and maintenance were decided largely on an empirical basis for the Humboldt County conditions. Rural areas with different terrain, population distribution, and transportation network may find variations of the container concept desirable. For instance, Chilton County, Alabama, is demonstrating containerized storage and collection using 4-cubic-yard containers. That area is a relatively flat farming area with a number of routes to each container site. In fact, no formal transfer facility is provided, but the containers are placed at the roadside and are generally intended only for wastes originating from household activities. The other types of solid wastes would be hauled to the disposal site by the individual or special collection arrangements would be made.

TABLE 1

MODIFIED LANDFILL AND CONTAINERIZED TRANSFER COST COMPARISON FOR PLANNING AREA I*

System	Capital cost			Annual cost Operation and amortization			Annual cost/ton+	
	Containers & transfer	Disposal site	Total	Containers & transfer	Disposal site	Total	Containers & transfer	Disposal site
Community landfills	$ -0-	$207,500	$207,500	$ -0-	$ 73,604	$ 73,604	$ -0-	$ 16.50
40-Cubic-yard system								
Type I	205,914	160,000	365,914	33,422	31,079	64,501	16.48	6.97
Type II	161,500	160,000	321,500	29,864	31,079	60,943	14.73	6.97
Type III	137,500	160,000	297,500	28,395	31,079	59,474	14.00	6.97
8-Cubic-yard system								
Type IV	126,400	160,000	286,400	26,868	31,079	57,947	13.25	6.97
Type V	236,914	160,000	396,914	35,514	31,079	66,593	17.51	6.97
Type VI	192,580	160,000	352,580	32,046	31,079	63,125	15.80	6.97

*From "Solid Waste Transfer and Disposal for Rural Areas," California Vector Views, 17(7):75, July 1970.

+Based upon 2,028 tons/year handled through containers and 4,460 tons/year for final disposal.

Recommendations

In view of the overall costs of the systems and the effects the ancillary variables (i.e., public preferences, public acceptability, and the system's influence in reducing county, State, and local indirect refuse management costs) and secondary cost factors (i.e., controlling fly production, spillage, site cleanup and maintenance due to vandalism) are destined to have on the success of the entire program, it was recommended that the county embark on a comparative evaluation program relating to the operational and functional characteristics of the 8-cubic-yard and 40-cubic-yard containerized storage and collection systems utilizing a central sanitary landfill for final disposal. Cognizant of the fact that a comparative evaluation program dictates the use of a transfer facility capable of servicing both container systems, it was further recommended that the basic site configuration designated as Type II be utilized in conjunction with the test program.

WORK PROGRAM (PHASE II)

On the basis of the feasibility study, the overall costs of the systems, and related qualitative findings, the county undertook the comparative demonstration program with the financial support of the Office of Solid Waste Management Programs, U.S. Environmental Protection Agency. The work program was divided into three stages encompassing a 3-year project period:

(1) Design and Implementation. Selection, design, construction, and "debugging" of the containerized collection and disposal operation.

(2) Data Collection. Operating the system in conformance with the recommended test program and conducting evaluation procedures to develop the required engineering, operational, cost, and public acceptance data.

(3) Evaluation. Evaluating all subsystems, ancillary variables, and related cost factors, documenting the results, and selecting optimum system for area-wide implementation.

Project Objectives

The primary impetus and driving force of this project has been the need for the development of a rural area collection and disposal system that can effectively reduce, at a reasonable cost, the sanitary and aesthetic objections arising from the existing system of numerous open dumps. Although costs have been and will continue to be the major deterrent to area-wide implementation, the system's effect on the total environment will also weigh heavily in judging its ultimate worth. It is for this reason that the emphasis of the demonstration project will be on both the evaluation of the system's effect on the environment and the development of proven and accurate operational cost data.

However, the operational cost factors that play such an important role in dictating the ultimate success of an engineering project of this nature, are not always limited to the direct operational and capital costs, but can depend to a great extent on the secondary and ancillary cost factors. It is the identification of the relative importance and dollar value of these factors that is one of the unique aspects of this program, and hopefully will enable Humboldt County, as well as other counties, to select a particular system that best satisfies its individual needs. It is this underlying premise that has shaped the development of the demonstration program.

The specific objectives of the demonstration project are to:

(1) Test the effectiveness of a containerized storage and collection system in reducing the fire hazards, public health hazards, air and water pollution, general unsightliness, and

aesthetic objections arising from existing practices in typical small rural isolated communities.

(2) Develop comparative engineering data relating to the operational and functional characteristics of the 8-cubic-yard and 40-cubic-yard containerized storage and collection systems.

(3) Delineate the advantages and disadvantages of the various site configurations, and ascertain the influence or effect of the ancillary variables (public preferences, public convenience, site maintenance, spillage, etc.) on the economics or practicability of the total system.

(4) Demonstrate the feasibility of an integrated solid waste storage, collection, and disposal system as a viable economic alternative to the existing system of numerous open dumps.

(5) Investigate alternative and/or unique sources of revenues and methods of financing the proposed system throughout the county that are available to rural areas but heretofore have not been utilized or applied to a project of this nature.

(6) Select the optimum system based on the above factors for countywide implementation and design appropriate systems and components.

(7) Disseminate all the generated information, data, operational experience, and conclusions, to all concerned regional solid waste management personnel, county and public officials, or other interested parties, through a series of short one-day practical seminars to be held periodically throughout the course of the project.

Program Design

The demonstration program was built around a single collection vehicle that is capable of servicing both the 8-cubic-yard bins and the large drag-on containers in an endeavor to define the operational and functional characteristics of: (1) a storage and collection system utilizing 8-cubic-yard containers, with and without lids, and a compaction-type collection vehicle; (2) a storage and collection system utilizing 40-cubic-yard containers, with and without lids, and a non-compaction-type collection vehicle, and; (3) two alternative site configurations. This unique vehicle consists of a standard understructure for servicing the 40-cubic-yard drop box system and a standard front loading compaction body equipped with hydraulic snap-on connections and skids that can be mounted on the understructure for servicing the small front loading bins. The two site configurations were envisioned to basically conform to that designated as Type II in the feasibility study, except that Type II-A will be designed so that the top of the containers will be level with the unloading platform, while Type II-B will be designed so that the top of the container will be approximately 30 inches above the unloading platform.

The basic program design will entail: (1) division of the test area into two subregions based on travel times and weekly refuse volumes; (2) construction of three container sites in each subregion; (3) placement of all the 8-cubic-yard containers in one subregion and all the 40-cubic-yard containers in the other subregion; (4) operation of the collection and disposal system for some initial period to familiarize the crew with pickup and unloading procedures, vehicle schedules and routes, container washing and site cleanup procedures, and maintenance of accurate and reliable records; (5) operation for an initial 9-month period to allow for adequate evaluation of all subsystems (containers with and without lids, container sites, transportation system, and disposal operation); and (6) switching the 8-cubic-yard and the 40-cubic-yard containers and operating the system for a second 9-month period.

Test Area

Planning Area I was selected for implementation of the demonstration system as it is typical of the isolated rural area for which this project was conceived. It comprises the lower, or southerly one-third of Humboldt County, and is bounded on the south by Mendocino County, on the east by Trinity County, and on the west by the Pacific Ocean. It contains 16 unincorporated communities, ranging in size from 150 to 1,100 persons. The approximate total population for this area is 10,000 persons. The area is presently serviced by two franchised collectors, operating principally in the Garberville and Dyerville areas along a narrow corridor paralleling the principal highway traversing the area. The two collectors provide regular service for approximately 1,300 persons. The area contains 11 open dumps; of these one is owned and maintained by the county; five are owned privately, but maintained by the county; two are owned and maintained by private individuals; and one is owned and maintained by the State Department of Parks and Recreation.

Within the area are three State parks, one major highway, numerous recreational areas and camping grounds, and one large subdivision at Shelter Cove. The region is typical of the coastal forests prevalent in Northern California, Oregon, and Washington i.e., transportation systems, geologic and atmospheric conditions, population distribution, economic dependency on the forestry resources, and generation rates of refuse. It is estimated that in addition to the normal residential refuse quantities, a substantial increase does occur during the summer months, due to the large influx of tourists. Typical of these areas, the small rural communities are serviced by secondary or logging roads. In the case of the demonstration area, one-way distances and travel times between the central landfill site and container sites have been estimated to range from 3 to 55 miles and 1/2 to 2-1/2 hours, respectively.

Work Approach

The administration of the project and the conduct of the respective work assignments were envisioned at the outset of the project to be a joint effort by the three principal participating agencies -- The Department of Public Works, County of Humboldt; Garretson-Elmendorf-Zinov-Reibin, Architects and Engineers; and Bartle-Wells Associates, Municipal Financing Consultants. The term "joint" was intended to imply an effective working relationship that went beyond the scope of the normal client-consultant contractual obligations and its inherent weaknesses. Specifically, the intent was to develop an implementation team whose members personally and professionally shared the responsibility for the design, selection, and implementation of the containerized collection system. The nature of this approach can best be exemplified by the preamble to the consultants' contract with the County of Humboldt--"The Engineer, in conformance with the general work programs and job responsibilities outlined shall assign one knowledgeable individual, hereinafter called Project Engineer, to personally participate in said demonstration project as a member of the project administration team...."

It is the staff's opinion that this goal was achieved and that its attainment stands as one of the major accomplishments of the first year's activities. Its success can be measured in terms of:

(1) The development of an effective working environment that stimulated members of the project team to expand and cross conventional management boundaries. The responsibility for coordination, planning, budgeting, design and control were mutually shared by the project administration team.

(2) The constant and free flow of information and feedback between the consultants' and county's personnel enabled both parties to maintain similar, if not identical, pictures of the project's goals, procedures, and needs in light of continuous, but expected changes in project parameters. This flexibility allowed the reshuffling of priorities, budgets, and time allocations.

(3) The utilization of the consultants' staff as an extension of the County Public Works Department, rather than as an outside consultant, permitted the Project Director to acquire, over the course of time, a reasonable level of expertise and training in the field of solid waste management. The translation of the consultants' expertise to local personnel who will ultimately be responsible for day-to-day management of the solid waste systems assures a level of operation up to the designer's expectations.

(4) The familiarization of two or more responsible individuals with all the technical, organizational, and philosophical aspects of the program to assure program continuity in the case of project personnel changes. The potential loss of personal knowledge and relationship of factors that occurred during the preceding phases of the project are thus minimized.

Project Control

Specific information was outlined within the initial application and the final agreements to insure that the four principal agencies and other involved groups effectively accomplished specific work assignments within budget allocations and time schedules. Certain administrative and fiscal requirements were established within each agreement, to insure project controls, and updated task flow diagrams were utilized to assess status of progress at frequent intervals.

The work assignments for accomplishing specific tasks on a systematic basis by all agencies, was utilized as a base for development of workable administrative and fiscal controls. Revised cost allocations were developed for inclusion in each consulting agreement. The yearly cost allocations, due to the 3-year length of contracts, were based upon a maximum amount of compensation (budget limit) with separate or yearly funding requirements. Authorization requirements were established for continuation of work beyond any funding period.

A summary itemizing the Man-Days/Personnel/Task on a yearly basis was utilized for control of work and progress payments during each budget period. All consultants were required to submit an estimate of proposed work and a basis of payment claim for work performed during the previous month. Any work or time expended by the consultant that was in excess of the initial allocated amounts was noted on progress payments, but remained unpaid. Provisions within each agreement allowed reallocation of initial time estimates 30 days after all services and advice under the specific annual funding period had been approved and accepted as completed by county. Provisions were also included for deductive and additive provisions and extra services. The agreements utilized, along with the payment format, allowed sufficient flexibility needed for controlling all progress payments throughout the fiscal periods and for properly accounting all expenditures for specific items of work that were carried over into subsequent funding period due to the delays experienced in implementing the project (Table 2).

Due to the magnitude of the project and the effect that specific critical tasks would have on the overall project, several schedules and task flow diagrams were developed for illustrating scheduled dates as per the application, as currently programmed, and as incurred or accomplished.

The Task Schedule Diagram (Figure 4) was developed subsequent to the execution of all agreements and during the preliminary development of the actual Testing Program that would be utilized. The Task Schedule Diagram was prepared in a manner to enable all involved agencies to rapidly assess the status of progress on an individual or overall task basis relative to initial and incurred progress and the effect of the adjustments needed for other tasks when a delay was incurred in any one task.

16

FROM ____197__ TO ____197__
AGREEMENT DATE NOV. 17, 1970
FUNDING PERIOD 01
BUDGET ALLOCATIONS: 438-2-118

COUNTY OF HUMBOLDT
SOLID WASTE DISPOSAL BY CONTAINERIZATION - PHASE II
PAYMENT FORM

CONSULTANT
GEZR
124 SPEAR ST.
SAN FRAN., CAL. 94105
TEL. (415) 434-3838

TASK	BARTLE WELLS @200 00					GARRETSON @160 00					HERSON @ 130 00					CIVIL MECH. ELEC. ARCH.					TOTAL EXPENDITURES PER TASK
	ALLOCATED MAN-DAYS	ACCUMULATED MAN-DAYS	ATTACHED INVOICE MAN-DAYS	TOTAL MAN-DAYS TO DATE	$	ALLOCATED MAN-DAYS	ACCUMULATED MAN-DAYS	ATTACHED INVOICE MAN-DAYS	TOTAL MAN-DAYS TO DATE	$	ALLOCATED MAN-DAYS	ACCUMULATED MAN-DAYS	ATTACHED INVOICE MAN-DAYS	TOTAL MAN-DAYS TO DATE	$	ALLOCATED MAN-DAYS	ACCUMULATED MAN-DAYS	ATTACHED INVOICE MAN-DAYS	TOTAL MAN-DAYS TO DATE	$ 125 00	
1						1.000	1.000	0	1.000	160 00	5.625	5.625	0	5.625	731 25						891 25
2						2.000	2.000	0	2.000	320 00	10.250	10.250	0	10.250	1332 50						1652 50
3						0.875	0.875	0	0.875	140 00	5.000	5.000	0	5.000	650 00						790 00
4						—	—	—	—	— 00	0.375	0.375	0	0.375	48 75						48 75
6a						1.000	1.000	0	1.000	160 00	10.375	10.375	0	10.375	1348 75	65	13.817	0	65.00	8125 00	9633 75
6bcd						1.625	1.625	0	1.625	260 00	15.500	15.500	0	15.500	2015 00	15	13.875	0	13.875	1734 38	4009 38
6e											0.750	0.750	0	0.750	97 50	0.75	0.75	0	0.75	93 75	191 25
7											24.375	24.375	—	24.375	3168 75	26.039	26.039	0	86.039	3243 67	6511 82
8a	2	2.000	0	2.000	400 00						8.000	8.000	0	8.000	1040 00						1440 00
8b	1.4	1.400	0	1.400	280 00						0.375	0.375	0	0.375	48 75						328 75
8c											0.500	0.500	0	0.500	65 00						65 00
11											2.750	2.750	—	2.750	357 50						357 50
15											7.250	7.250	0	7.250	942 50						942 50
17											5.250	5.250	0	5.250	682 50						682 50
20											8.625	8.625	0	8.625	1121 25						1121 25
SUBTOTALS	3.4	3.400	0	3.40	680 00	6.500	6.500	0	6.500	1040 00	105.00	105.00	—	105.00	13,650 00	106.789	106.789	0	106.789	13,296 20	28,666 20

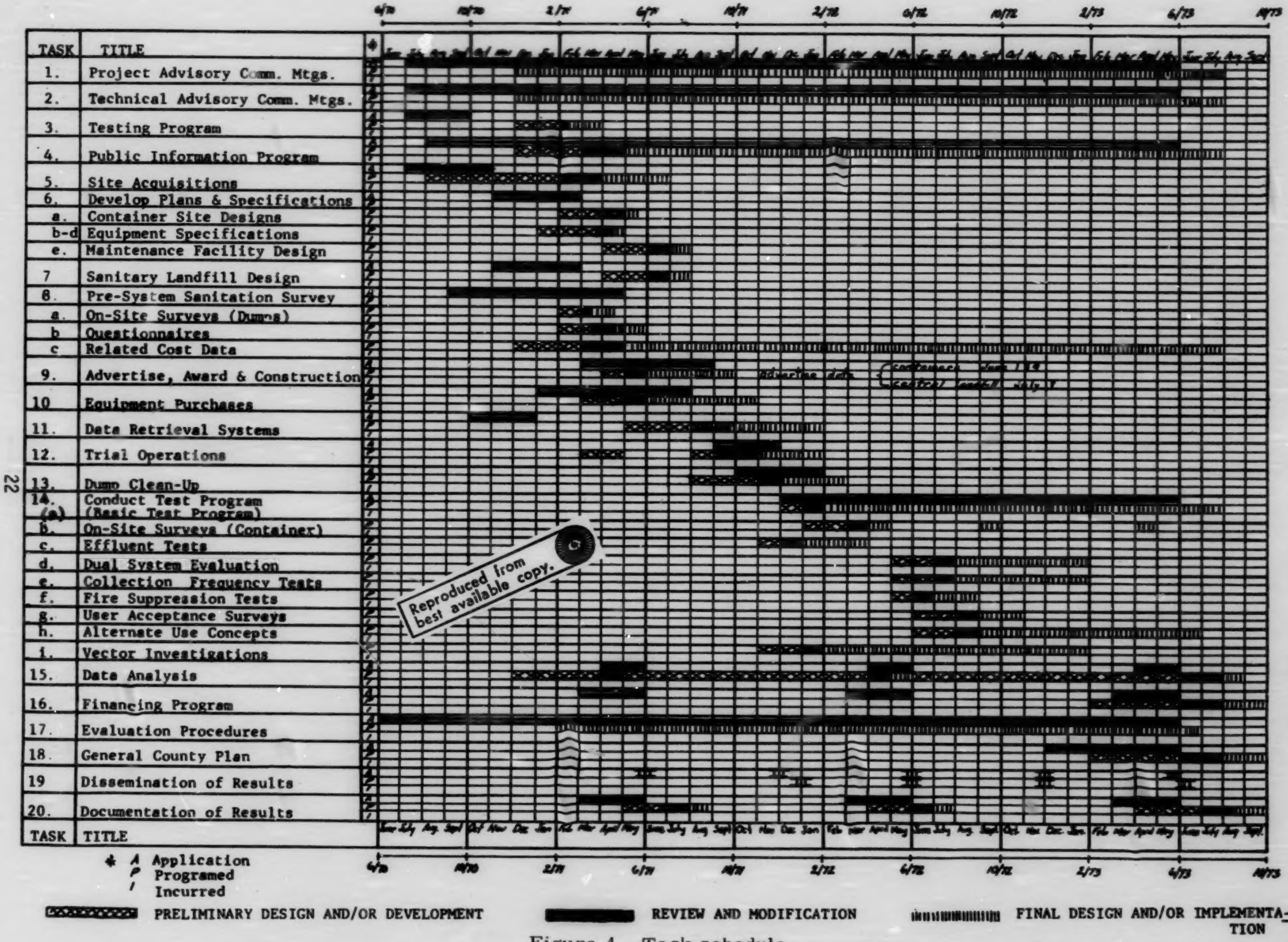
MADE BY F.W.C
CHECKED BY JH
SUBMITTED BY Guy C Kulisch
Director, Department of Public Works
DATE 6/15/71

SUPPLIES AND TRAVEL EXPENSES

ITEM	ALLOCATED	ACCUMULATED	INVOICE	TOTAL
TRAVEL	1296 80	—		1296 80
SUPPLIES	BUDGET NO.			
FILM	438-2-023	229.96		229 96

TRAVEL	1296 80
SUPPLIES	229 96
TOTAL VALUE OF WORK	30,192 96
10% SALARY RETENTION	2866 62
TOTAL DUE TO DATE	27,326 34
PREVIOUS PAYMENTS	26,689 59
BALANCE DUE ON THIS ESTIMATE	636 75

Table 2. Sample payment form.



Reproduced from best available copy.

Figure 4. Task schedule.

Due to property acquisition delays, incurred in the spring of 1971, project officials were concerned that the construction activities of the project might not be undertaken until a time that adverse weather in the fall would require the suspension of construction work until the spring of 1972. This concern, and the need to interrelate all construction activities, led to the development of several task flow charts for all activities connnected with the design, specifications, advertisement, and award of all equipment purchases and construction activities (Figure 5).

Project Support

The demonstration project was proposed as a joint venture by four principal parties responsible for the majority of work for accomplishing the comparative evaluation of the containerized system. In addition, there were a number of agencies and groups that assisted the principals in coordinating the public information program, in reviewing and guiding the program, and in planning for implementation throughout the county. The agencies included the Administrative, Environmental Health, and Air Pollution Control District Offices of the county; the California State Department of Parks and Recreation; the California Division of Forestry; and Humboldt State College.

Representatives of the above agencies participated as members of a Project Advisory Committee, established during Phase I of the project, and continued activities for guiding and reviewing the demonstration program. Monthly meetings were held to insure that the project was implemented and will be operated as closely to the overall project goals as possible. A list of the Project Advisory Committee members is included in Appendix A, Exhibit 1.

The above Advisory Committee not only provided a means for reviewing and guiding the program, but also served as a procedure for recording the current status of the project and recording the group's concensus on areas of the project that additional effort or alternative solutions should be considered.

Work Assignments

The work assignments for specific tasks were outlined in the initial application and were utilized for development of the administrative and fiscal controls. Work assignments included within the initial application were allocated to the participating agencies by (1) accurately describing some 20 distinct tasks to insure project objectives were met; and (2) listing the actual responsibility of each agency in connection with each task (Appendix A, Exhibits 2 through 4).

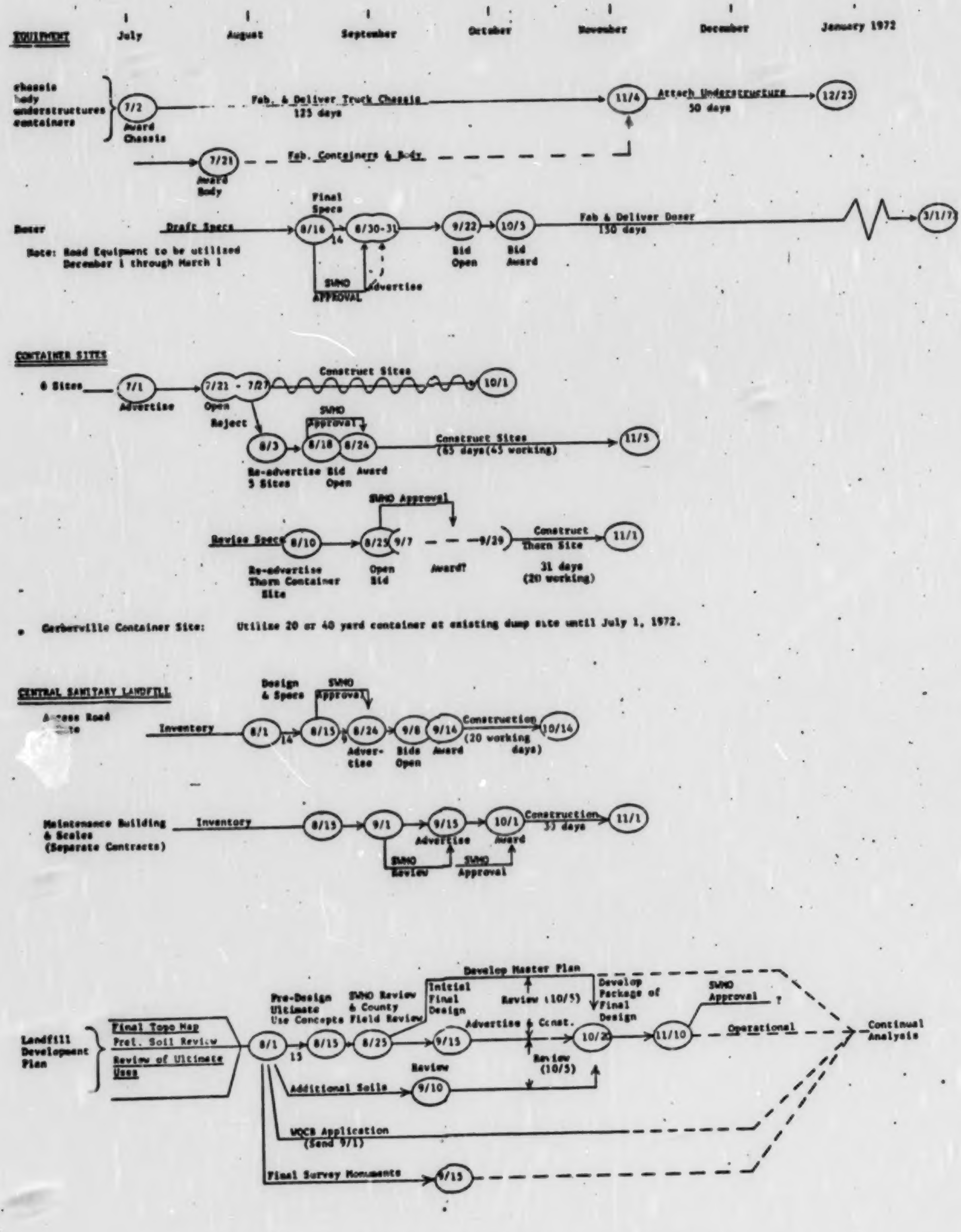

EQUIPMENT
July
August
September
October
November
December
January 1972
chassis
body
understructures
containers
7/2
Award Chassis
Fab. & Deliver Truck Chassis
125 days
11/4
Attach Understructure
50 days
12/23
7/21
Award Body
Fab. Containers & Body
Dozer
Draft Specs
Final Specs
8/16
14
8/30-31
9/22
10/5
Bid Open
Bid Award
Fab & Deliver Dozer
150 days
3/1/72
SWMO APPROVAL
Advertise
Note: Road Equipment to be utilized December 1 through March 1
CONTAINER SITES
6 Sites
7/1
Advertise
7/21 - 7/27
Open
Construct Sites
10/1
Reject
8/3
SWMO Approval
8/18
8/24
Re-advertise 5 Sites
Bid Open
Award
Construct Sites
(65 days(45 working)
11/5
SWMO Approval
Revise Specs
8/10
8/25
9/7
9/29
Re-advertise Thorn Container Site
Open Bid
Award?
Construct Thorn Site
31 days (20 working)
11/1
Gerberville Container Site: Utilize 20 or 40 yard container at existing dump site until July 1, 1972.
CENTRAL SANITARY LANDFILL
Access Road Site
Inventory
8/1
14
Design & Specs
SWMO Approval
8/15
9
8/24
Adver-tise
9/8
Bids Open
9/14
Award
Construction (20 working days)
10/14
Maintenance Building & Scales (Separate Contracts)
Inventory
8/15
9/1
SWMO Review
9/15
Advertise
SWMO Approval
10/1
Award
Construction 33 days
11/1
Landfill Development Plan
Final Topo Map
Prel. Soil Review
Review of Ultimate Uses
8/1
15
Pre-Design Ultimate Use Concepts
8/15
SWMO Review & County Field Review
8/25
Initial Final Design
Develop Master Plan
Review (10/5)
9/15
Advertise & Const.
Review (10/5)
Develop Package of Final Design
10/2
11/10
SWMO Approval
?
Operational
Continual Analysis
Additional Soils
Review
9/10
WQCB Application (Send 9/1)
Final Survey Monuments
9/15

Figure 5. Task flow diagrams – programmed.

The information contained within the application served as the basis for developing the exhibits for each agreement that defined the legal obligations of each participating consultant. The overall review of proposed work assignments and the procedures for establishment of a similar format for a parallel-type of agreement can be best assessed by reviewing the information contained within Appendix A.

DESIGN AND IMPLEMENTATION

The design, advertisement, and award of the contracts for construction of the containerized collection facilities and purchase of the related rolling stock, containers, and miscellaneous components involved the completion of seven major and mutually dependent work areas. These activities were jointly undertaken by the participating agencies; the findings, conclusions, and suggested approaches were regularly funneled through the advisory committees and funding agencies for distillation and refinement. The investigations undertaken, questions raised and resolved, pertinent factors, decision-making criteria, and constraints imposed on the project are carefully detailed in the following sections of this report. It is our belief that the procedures we employed in resolving the many design problems and their effectiveness in arriving at satisfactory solutions are immensely more valuable to the reader in implementing projects of this nature in other areas than a detailed description of the end product itself. It is for this reason that the report emphasizes those areas that will hopefully provide the reader with insight on the major implementation constraints--the attitudes of the rural citizens, property acquisition problems, and equipment needs. A complete set of purchase and construction documents, and construction specifications for those who are interested, can be requested as a supplement to this report. The seven major work areas included:

- The development of a testing program that insures the rational development and logical accumulation of the necessary comparative engineering data.
- A presystem sanitation survey to document existing conditions, present dump usage, individual dumping habits, public attitudes on existing dump conditions, and social constraints affecting the implementation of the rural area containerized collection system.
- The selection and acquisition of the six container facilities and the central sanitary landfill.
- The development of final plans and specifications and award of construction contracts for the container facilities and access roads.
- The investigation of alternative collection equipment, truck chassis, and container systems, the development of purchase specifications, and award of contracts.
- The development of final plans and specifications for the centrally-located sanitary landfill including operating procedures, final site usage, and environmental controls.
- A public information program aimed at informing and educating the general public in the demonstration area as to the nature and purpose of the pilot program to facilitate the implementation process.

Implementation Schedules

As noted in the Project Control Section of the Phase II Program, a Task Schedule Diagram was developed during preliminary work on the testing program that would be utilized. The programmed task schedules paralleled those of the initial application except for the following: (1) the completion date of the project was extended 4 months to insure sufficient time to evaluate and include all operational data in the final report; (2) the time period for site acquisitions was extended to allow a more realistic assessment of the procedures and possible delays that were anticipated after initial site determination had been made; (3) design schedules of the container sites and the sanitary landfill were delayed to allow a better appraisal of the needed design criteria that might be imposed by the selected equipment.

The proposed task schedules, as submitted in the initial application, projected completion of the design phase and the construction of facilities during the first project year with trial operations set for October of 1971. Actual trial operation of the system will not occur until the summer of 1972, as construction work had to be suspended due to adverse weather.

The inability to implement the project as initially proposed was largely due to the delays incurred in acquiring needed property and additional delays incurred in evaluating and agreeing upon the action to be taken in light of container site construction bids that exceeded budgeted amounts. Detailed information relative to each of the above delays and the resulting alteration of, or effect upon, other task schedule changes are included in later sections of the report.

Testing Program

The two-phase testing program developed to insure the rational development and accumulation of the necessary data to effectively evaluate the containerized collection and disposal systems was based on discussions with county personnel, the Technical Advisory Committee members, and the respective equipment representatives. Its objectives were to develop comparative engineering data relating to the functional and operational characteristics of the two alternative containerized storage and collection systems. It was hoped that evaluation of the data would permit subsequent improvements in the design and implementation of a containerized collection system for the remaining rural areas of Humboldt County. The major goals of the test program developed were to:

(1) Determine the overall effectiveness of the 8-cubic-yard and the 40-cubic-yard containerized storage and collection systems. The principal aim is to develop appropriate cost data to firmly predict the respective system's total operational costs per ton of collected wastes.

(2) Delineate the advantages and disadvantages of the basic site configuration and ascertain the effect, if any, of a 30-inch elevation difference between the dumping platform and the container opening. The basic question centers around the justification of a two-level site and its inherent construction costs in terms of increased consumer convenience and site maintenance savings.

(3) Define the need and/or effectiveness of the container lids. The major contention here is that, although lids offer a certain degree of protection from vectors, fire and litter problems, their inherent difficulties and potential negative-use characteristics may impede the residents' use of the containers.

(4) Ascertain the influence of collection frequency with respect to site spillage and related maintenance problems on those sites where container capacity can permit a collection schedule to be varied from twice a week to twice a month. The goal of this test is to define the optimum collection frequency, considering costs and related health and environmental hazards for sites that generate relatively little, but collectable quantities of solid wastes.

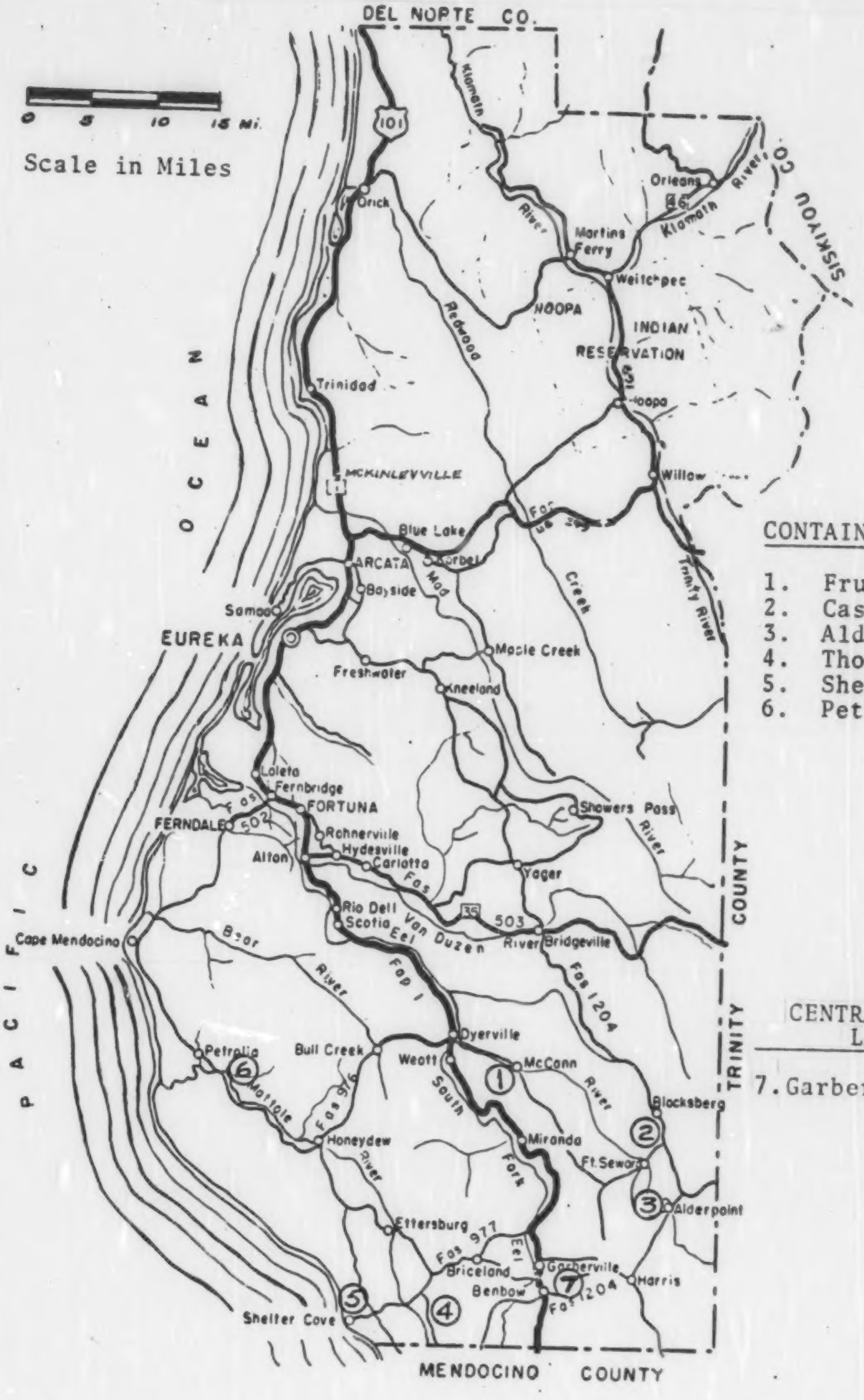
(5) Evaluate the practical and economic feasibility of utilizing on a routine basis, a combined system incorporating both the 8-cubic-yard and 40-cubic-yard system. Such a combined system offers the potential advantages inherent to both systems, namely reduced travel time and related collection costs and unlimited acceptance of all types of wastes.

In light of the objectives summarized in the preceding section, the containerized system implemented in Planning Area I was designed and constructed and will be evaluated in conformance with the following recommendations. It should be emphasized that the program was built around the premise that the development of reliable comparative data on the 8-cubic-yard and the 40-cubic-yard storage and collection systems was the overriding purpose of the demonstration project.

Division of Test Area. The test area (Planning Area II) was subdivided into two complementary subregions with Highway 101 representing the division line. Each subregion includes the following three container sites:

- Subregion West--Thorn, Shelter Cover, and Petrolia
- Subregion East--Alderpoint, Blocksburg, and Fruitland

The division of the test area was based on the travel times, highway conditions, weekly solid waste volumes, and related pertinent information supplied by county personnel. It was felt that this particular combination was effective in that each subregion contains two sites (i.e., West--Thorn and Shelter Cover, East--Alderpoint and Blocksburg) favorable to the 8-cubic-yard system (Figure 6).


DEL NORTE CO.
0 5 10 15 Mi.
Scale in Miles
101
Klamath
Orick
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Klamath River
Martins Ferry
River
Weitchpec
SISKIYOU CO.
Redwood
HOOPA
INDIAN
RESERVATION
Trinidad
Hoopa
Willow
MCKINLEYVILLE
O C E A N
Blue Lake
Fas 299
ARCATA
Korbel
Mad
Creek
Trinity River
Bayside
Samoa
EUREKA
Maple Creek
Freshwater
Kneeland
Loleta
Fernbridge
FORTUNA
Showers Pass
FERNDALE
Fas 502
Rohnerville
Hydesville
Alton
Carlotta
River
Fas
Yager
35
503
Van Duzen
River
Bridgeville
TRINITY COUNTY
Cape Mendocino
Scotia
Rio Dell
Eel
Bear
River
Fas 1
Fas 1204
Dyerville
Petrolia
Bull Creek
Weott
McCann
South
River
Mattole
Fas 916
Blocksberg
Honeydew
Miranda
Fork
Ft. Seward
River
Alderpoint
Ettersburg
Fas 977
Eel
Briceland
Garberville
Benbow
Fas 1204
Harris
Shelter Cove
P A C I F I C
MENDOCINO COUNTY
1
2
3
4
5
6
7

CONTAINER SITES

1. Fruitland
2. Casterlin
3. Alderpoint-Harris
4. Thorn
5. Shelter Cove
6. Petrolia

CENTRAL SANITARY LANDFILL

7. Garberville

Figure 6. Proposed rural area collection and disposal system (planning area I).

Test Sequence. The suggested test program was based on three consecutive 6-month periods to insure the adequate investigation of the major variables during the limited 18-month test period: the first and third periods for the so-called basic test program and the middle period for the special evaluation procedures and tests. Its pertinent features and an illustrative pattern for contrasting specific site records to evaluate the required variables are depicted in Figure 7. In general, the recommended test arrangement should permit:

(1) Evaluating user response to the two basic containment systems at all six container sites over similar operating conditions, such as time span and user characteristics.

(2) Contrasting individual site records under both operating conditions to ascertain the effect of the lid and elevation factors.

(3) Developing appropriate operational data at the Petrolia-Honeydew and the Fruitland and Alderpoint sites, without destroying the basic data base, to evaluate the feasibility of periodic collections and a combination system, respectively.

(4) Evaluating the effectiveness of the 8-cubic-yard and the 40-cubic-yard systems by (a) contrasting the total costs for operating the respective systems in Planning I during two similar 6-month spans (August to February); (b) comparing the total costs for operating the two systems in the respective subregions for a consecutive 12-month period (August 1972 through July 1973); and (c) contrasting the data for operating the two systems within the same subregion for two similar 6-month time spans.

System Requirements. The general system requirements dictated by the preceding test arrangement include provisions for the construction and/or purchase of the container facilities and related equipment. These requirements were general in nature, but provided a foundation for designing and implementing the recommended systems. The construction of six container sites use a common site plan compatible with both the 8- and 40-cubic-yard drop boxes. The basic plan conforms to the general requirements of Type II with standard designs and specifications for retaining walls, earthwork, fencing, drainage, and roads. A major variation is that two of the six facilities, one within each subregion, are designed with the top of the containers approximately 30 inches above the dumping level. The sites at Shelter Cover, Thorn, Alderpoint, and Blocksburg are based on the basic level design, and the sites at Petrolia-Honeydew and Fruitland are based on the lower level plan. The design of these sites also includes specific provisions for:

(1) Preventing general litter and blowing papers from leaving the site. Preventive measures to include adequate fine mesh fencing and proper site placement with regard to prevailing winds.

(2) Adequate curbing to prevent vehicles from damaging containers and backing off side slopes.

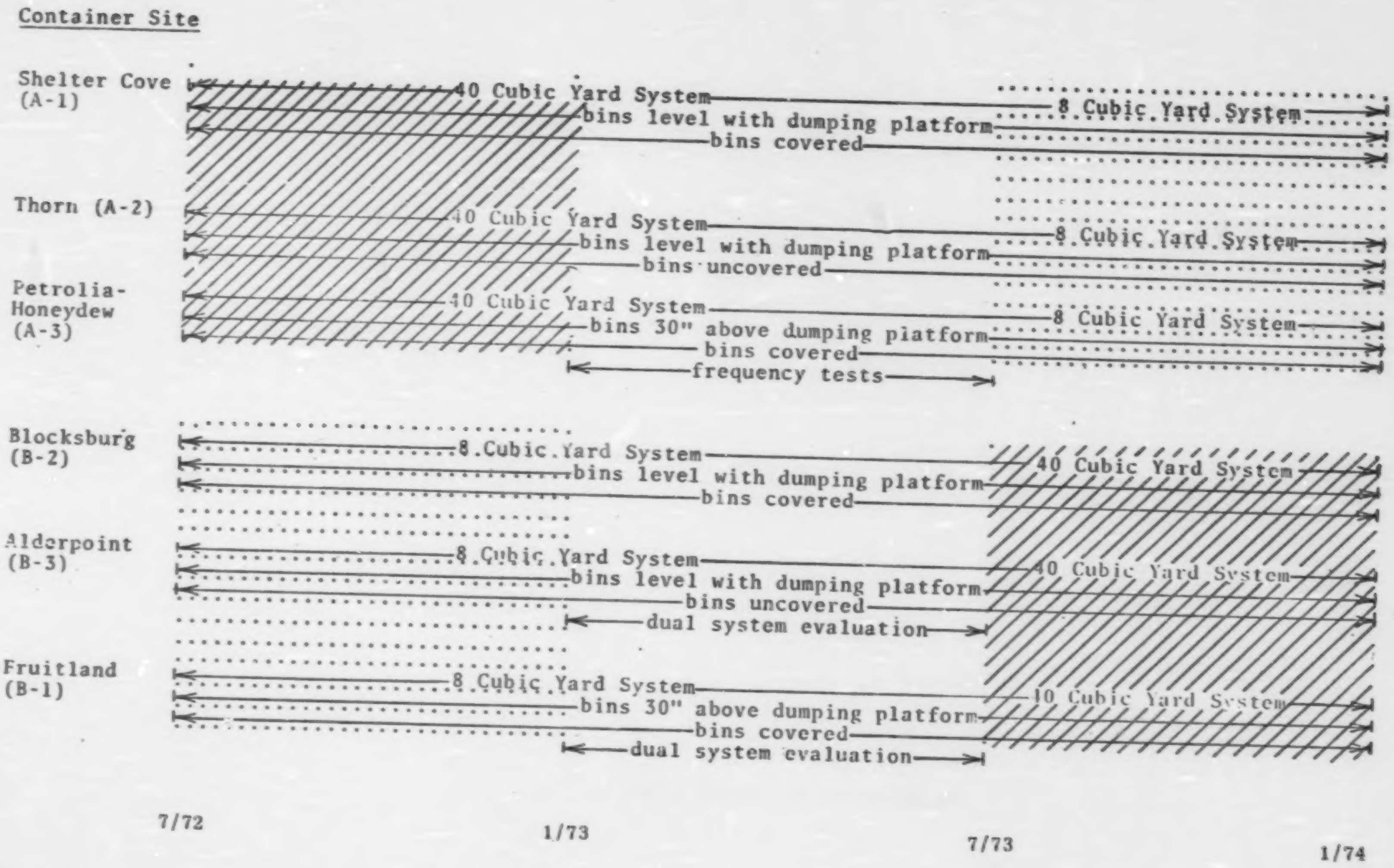


Figure 7. Rural area containerized collection system test sequence.

(3) Facilitating maintenance by allowing operator to sweep the wastes accumulated on the dumping platform directly into the containers.

(4) Preventing a housewife or other persons from dropping trash containers into drop boxes.

(5) Preventing loose waste or debris from falling between retaining wall and container.

Two collection vehicles were selected and purchased to service both the 8-cubic-yard front-end loading containers and the 40-cubic-yard drag-on drop boxes. The equipment was to be commercially available as an integrated unit with a sound history of use including past operational data and statistics. The compaction body (30-cubic-yard minimum capacity) was to be capable of being mounted on the chassis (with hydraulic snap-on connections) and servicing and cleaning the 8-cubic-yard bins at the container sites. The vehicle was also to have a potential for dragging a loaded 40-cubic-yard drop box a short distance to facilitate unloading and transfer procedures.

The containers specified and purchased were to be of standard quality and construction with special provisions for detachable counter-balanced lid systems. The containers and lid systems were to be designed in conformance with the collection vehicles requirements to insure equipment compatability. To accommodate the basic and special test programs, the following type and number of containers were to be purchased:

Number	Type	Special Modifications
5	Standard 40-cubic-yard drop boxes	Skids, rear wheels, tail gate, and two-to-five standard counter-balanced lids
2	Standard low-slung 20-cubic-yard open drop boxes	Skids, tail gate, and tarp
18	Standard 8-cubic-yard containers	Pickup channels and specially designed counter-balanced lid system

Servicing Schedules. The proposed servicing schedules included time provisions for travel, container loading and/or transfer, site maintenance, unloading, daily and weekly truck maintenance, and daily and weekly record maintenance procedures. A 5-day schedule was utilized to maximize the principal operator's workload. Route Schedules A and A^1 (Appendix B, Exhibits 5 and 6) pertain to the test periods of August 1972 through July 1973, and August 1973 through January 1974, respectively. Appendix B, Exhibit 7, summarizes the total time and mileage for servicing Planning Area I (all six sites) for the respective systems. A review of the cumulative travel times points out the inherent advantages of the 8-cubic-yard collection system. The distance travel time map is included in Appendix B, Exhibit 8.

Work Schedules. The work schedules were based on the proposed servicing schedules and the utilization of a three-man work crew (Appendix B, Exhibits 9 and 10). The three-man crew would, in the staff's opinion, minimize labor costs, maximize crew efficiency, and provide trained standby personnel. The principal operator would assume primary responsibilities for servicing the container sites and operating the heavy equipment at the Garberville central landfill site; the secondary operator would be backup for the primary operation; an attendant would assure that the Garberville central landfill site is manned full time. Under these conditions, it was estimated that the "normal" weekly manpower requirements were approximately 72 hours. For the trial operation period, the county was planning to utilize the primary and secondary operator full time to acquaint them with the operation of both the collection and landfilling equipment and the required recordkeeping procedures.

Property Acquisition

Although many agencies responsible for the acquisition of property may find geographical conditions less adverse than those of Humboldt County, our experience is that the acquisition for solid waste related facilities will generally create a negative public reaction and stiff opposition to any one particular site. Representatives of the Department had hoped to establish a realistic program to reduce the impact of public opposition in the final selection of a suitable landfill site. As previously noted, right of way acquisition was one of the major delaying factors in the project.

The following sections illustrate the approach taken, the desired and actual results for acquiring the needed parcels, and recommendations on how representatives should approach a similar acquisition in the future.

Approach Taken. Office investigations and field reviews for the location and purchase of the necessary container sites and the central landfill site were initiated prior to funding of the project. The following procedures were utilized in the initial evaluation for both the container sites and the central landfill:

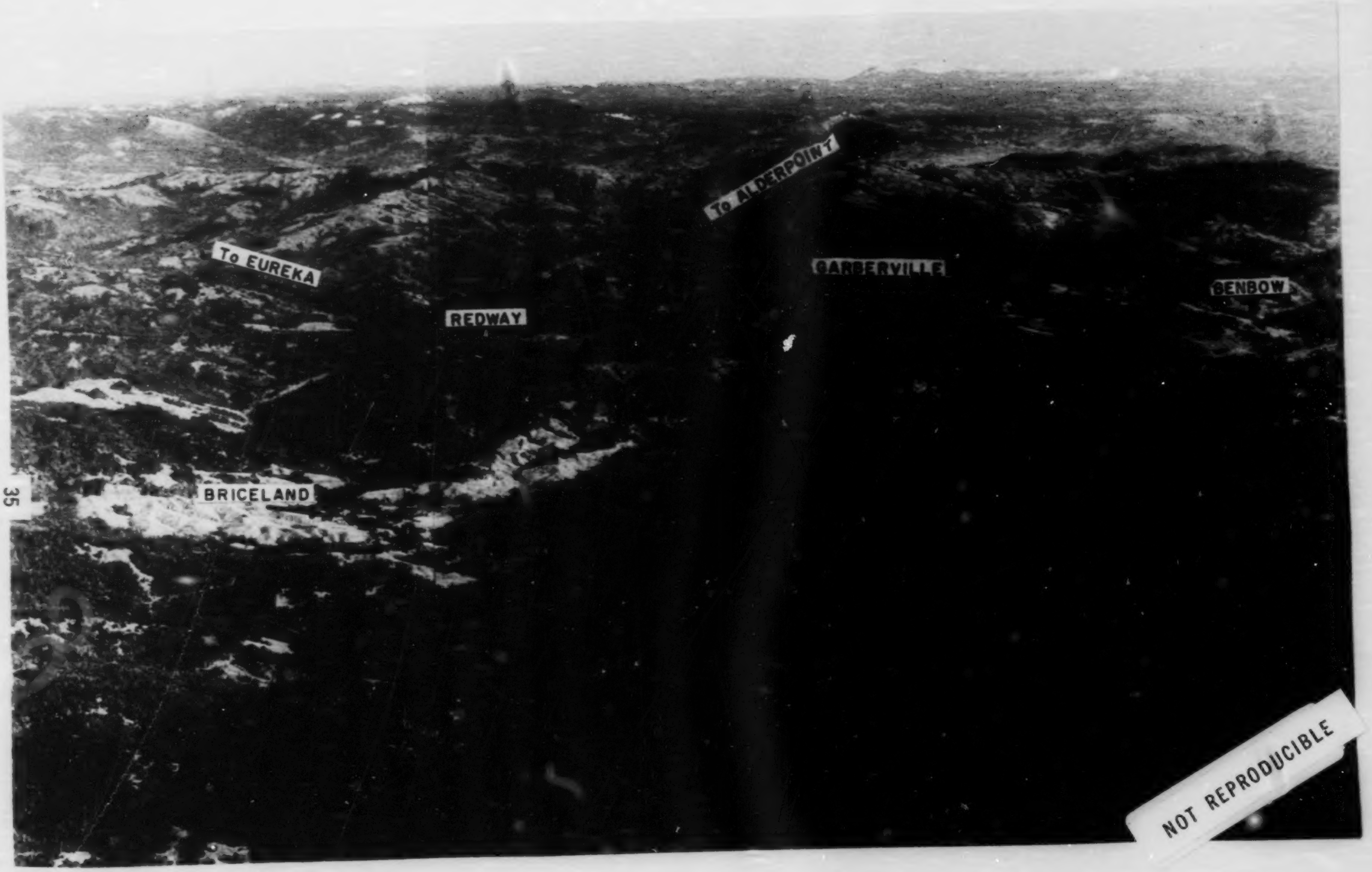
- Review of current aerial photographs and timber appraisal maps for potential sites in the areas set forth in the initial application.
- Field reviews to confirm site suitability.
- Letters indicating the need for either the container site or central landfill site containing a summary of the concepts of operations and requesting a response of the property owners' willingness to discuss such.

The approach utilized by the Department of Public Works was to locate sites that were (1) within the general geographical area set forth in the application; (2) suitable for development; and (3) acceptable to the property owner. This approach was deemed necessary as the county did not have the power for immediate possession of property, through condemnation, for solid waste disposal purposes. Indications were given that a time lapse in excess of 1 year would be required between initial court action and final possession of the property, which would be well beyond the time allocated within project schedules for operation of the system.

Geographical Area. The general geographical area of the project was mountainous, with several ridges generally parallel and extending in a northwesterly direction through the southerly area of the county. The typical terrain conditions prevalent throughout the county are depicted in the photograph of Southern Humboldt County (Figure 8). The above geographical conditions, along with the population distribution and criteria utilized for selection of the areas set forth in the initial application, and imposed limitations on the areas suitable for needed sites will be described further in the following sections of this report.

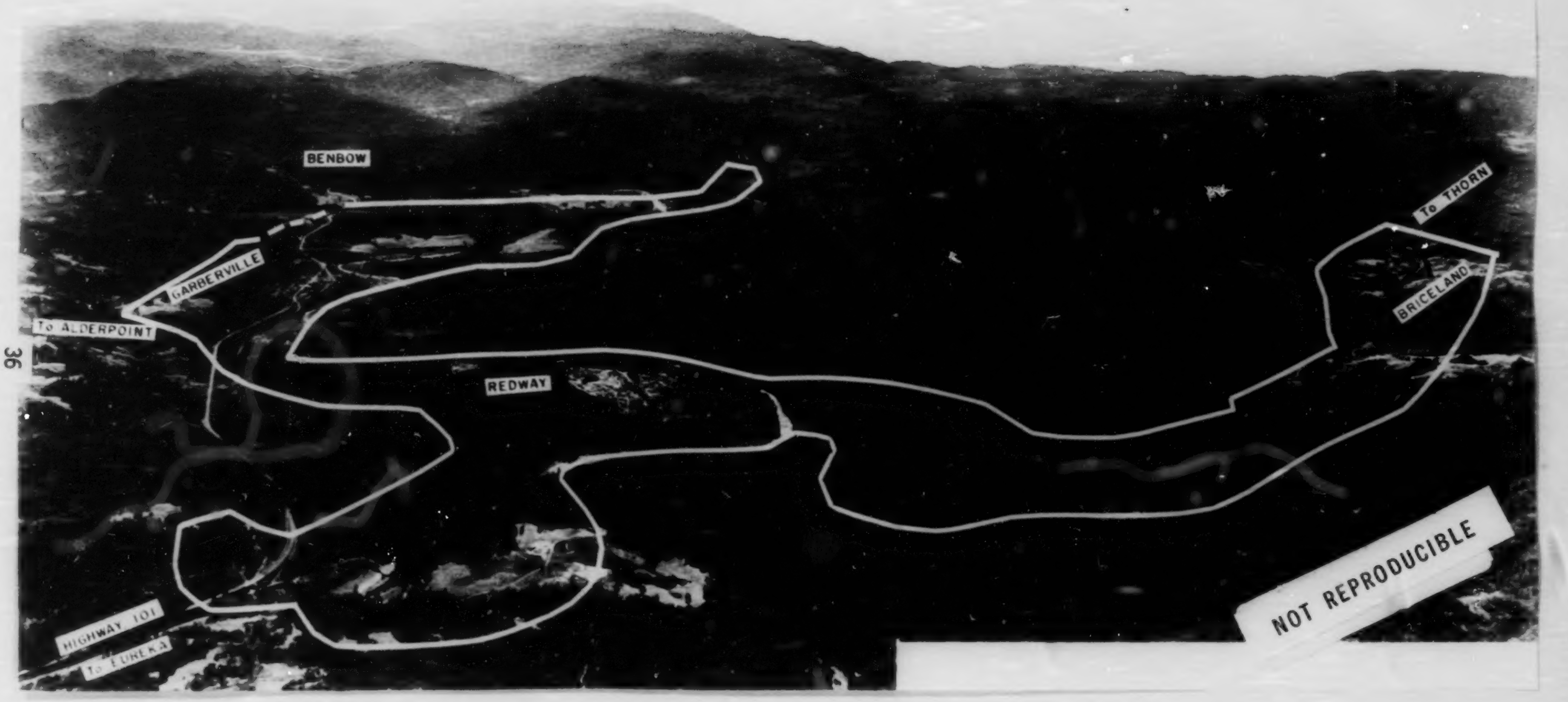
Central Landfill Acquisition. The proposed location of the central sanitary landfill was in the Garberville-Redway area. The reasonable limits for locating the site were established primarily within Township 4 South, Range 3 East (Figure 9). The geographical limits were based on travel times, the centralized population area, and existing highway locations. The specific criteria are as follows:

- The initial project criteria--local disposal sites located not more than 8 miles from the rural population centers--applies to the central site as well as the remote sites (Table 3).
- The center of population is in the Garberville area, and a landfill in the Garberville area would effectively service recreational areas and other communities surrounding Garberville on both the north and south.
- Collection roads to the proposed container sites connect to Highway 101 in the Garberville-Redway area, insuring minimum haul distances and economical servicing routes.
- Industrial developments and the general public are located within reasonable travel times of the proposed landfill service zone.


To EUREKA
To ALDERPOINT
GARBERVILLE
BENBOW
REDWAY
BRICELAND

NOT REPRODUCIBLE

Figure 8. Typical Humboldt County terrain conditions.


BENBOW
GARBERVILLE
To ALDERPOINT
REDWAY
HIGHWAY 101
To EUREKA
To THORN
BRICELAND

NOT REPRODUCIBLE

Figure 9. Central landfill area (Garberville – Redway).

TABLE 3

ONE-WAY TRAVEL TIMES WITHIN THE PROPOSED CENTRAL LANDFILL GEOGRAPHICAL AREA

Central Landfill Location	Community Serviced	Travel Time
Briceland	Garberville	8.5 miles - 15 minutes
	Richardson's Grove	16.5 miles - 27 minutes
Phillipsville	Garberville	11.0 miles - 12 minutes
	Richardson's Grove	19.0 miles - 23 minutes
West of Airport	Garberville	4.5 miles - 10 minutes
	Richardson's Grove	12.0 miles - 24 minutes

The parcel suitable for a landfill should be within a 1/2 mile map distance from access points from existing State routes or the county's maintained road system. The development cost for the access road was estimated at $100,000 per mile for an 18-foot roadway in moderate terrain. An access road of 1/2 mile would therefore necessitate an expenditure of $50,000, or more--an excessive cost in relation to land values ($2,000/acre).

As 35 to 40 acres are required for the estimated service life of 25 years, all parcels to be considered should be greater than 35 acres. Although two smaller parcels could be utilized, locating them and obtaining permission to initiate on-site surveys would be very difficult.

The ideal terrain type for a sanitary landfill is a compromise of specific items to insure its proper operation:

- View from existing roads.
- Suitable geological conditions and soil characteristics. Canyon areas would be suitable if stream and/or surface waters could be diverted and the perimeter fill slope of the landfill are no greater than 4:1.
- Development to serve as a land reclamation project.

Initial contacts with parcel owners were made by introductory letters containing information on the proposed project and including an outline of the criteria of the central site (Appendix C, Exhibit 11). By the fall of 1970, the majority of realtors in the southern third of the county had been contacted and agreed to assist the Department of Public Works in locating a suitable site for the landfill. Although substantial effort was put forth by the county and local realtors in the subsequent period, no potential landfill sites were found.

After additional field evaluations, the Department of Public Works initiated action for the evaluation of a site adjacent to the existing dump site. The Department also prepared a site location map for assessment of all potential parcels within the proposed area (Figure 10). The site location map served as a visual assessment of all parcels within the geographical area, and included overlays, a color code, and other information for illustrating (1) areas within reasonable access of existing roads; (2) eliminated parcels (less than 35 acres of land, community sites, and other developed areas); (3) ownership of remaining parcels.

The Department made no attempt to assess the geological conditions of any area unless the owner agreed. All acquisition steps between January and March were limited to re-evaluation of possible sites and continued negotiations with the owner of land adjacent to the existing dump site.

The County of Humboldt was very fortunate that one of the major landowners offered a suitable parcel for use as a central landfill, as (1) negotiations with the owner of the parcel adjacent to the dump site were terminated due to lack of agreement; and (2) the continuous effort to locate alternate sites between January and May was unsuccessful. Acquisition steps on this property had proceeded sufficiently by the first of June to allow the continuance of the project.

Container Site Acquisitions. Initial site location determinations were completed for the six container sites during August of 1970. Proposed locations were as per the initial project application except that the Alderpoint-Harris site was relocated closer to the community of Alderpoint because the majority of wastes would be generated in the Alderpoint area and because a previous road realignment within a mile of Alderpoint was a suitable location.

During the initial evaluations, it was determined that the county did not own the three sites previously indicated in the initial application (Thorn, Fruitland, and Petrolia-Honeydew). The proposed locations were within areas of extensive individual or corporation ownerships, thus limiting the number of potentially receptive owners. All of the involved owners were contacted in November for obtaining entry permits for surveying purposes, subsequent to field reviews and office research by representatives of the Right of Way Division.

The owners of four of the sites were generally in favor of upgrading the system, and suitable agreement were reached for the acquisition or long-term leases of the proposed sites. The two sites that required new locations were the Alderpoint and Thorn sites, and these were the only ones that delayed design and construction aspects of the overall project. The county, due to anticipated delays for condemnation procedures, concurred with the owner's demand that a large parcel of land be purchased

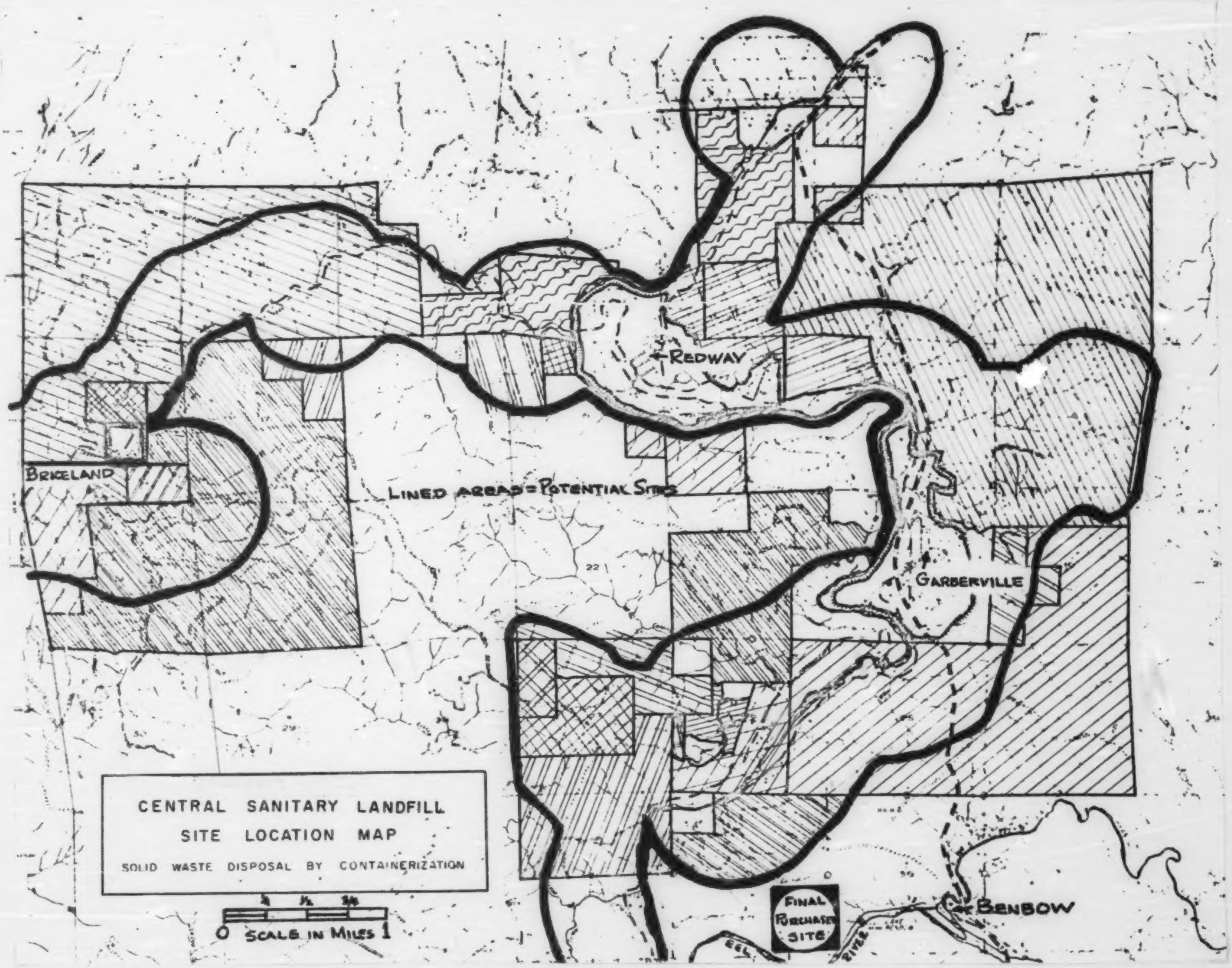

REDWAY
BRICELAND
LINED AREAS = POTENTIAL SITES
22
29
GARBERVILLE
CENTRAL SANITARY LANDFILL
SITE LOCATION MAP
SOLID WASTE DISPOSAL BY CONTAINERIZATION
0 ¼ ½ ¾ 1
SCALE IN MILES
FINAL PURCHASED SITE
BENBOW
EEL
RIVER

Figure 10. Central sanitary landfill site location map.

for the Alderpoint site. This action, and the resulting press coverage, is believed to have created the acquisition delays that were incurred on the Thorn site and the subsequent acquisition of a larger parcel of land here also.

One of the factors that was utilized in selling the concept and the related container sites to the landowners was that the majority of rural community residents supported the improvement of the existing waste disposal practices and were in favor of the establishment of the container sites.

Collection Equipment

Purchasing specifications had to be developed for an integrated refuse collection system that conformed to the general requirements of the demonstration program and that could service both the front loading and drag-on type container and storage systems. Equipment included two interchangeable multipurpose collection vehicles with three-axle truck chassis and tilt and dump understructures; one detachable compaction body and front loader; five 40-cubic-yard drop boxes with counterbalanced reversible lids; two 20-cubic-yard low-bodied drop boxes; and twenty 8-cubic-yard front loading containers with lids. The development of these specifications encompasses three major areas: (1) a comprehensive survey and evaluation of applicable refuse storage and collection systems; (2) an investigation of the trucking requirements peculiar to the isolated and rural areas of southern Humboldt County; (3) a review of the so-called standard bidding and purchasing policies associated with the solid waste industry.

It was through this latter item and the recognition of the inherent, and heretofore neglected, problems in selecting the component systems--chassis, understructure, compaction body and containers--to achieve a balanced design, that an attempt was made to formulate a rational basis for purchasing waste collection equipment. The primary aim was the establishment of a purchasing policy that would favor the selection of an integrated and workable unit that would afford the county maximum dependability and payloads. The following paragraphs describe the investigations, findings, specific selection criteria utilized, and recommendations for improving the criteria. These programs were conducted on a joint basis with the county assuming major responsibility for the initial equipment surveys and chassis investigations and the engineer assuming major responsibility for formulating the specific selection criteria.

Collection Equipment Investigations. To evaluate the feasibility and identify the limiting parameters and constraints of operating a single vehicle capable of servicing both the front loading and drag-on type container systems, four major equipment investigations were conducted during the project's first 5 months. These included: (1) surveys of applicable equipment manufacturers and their ability to provide multipurpose vehicles; (2) field demonstrations of potential equipment suppliers; (3) weight distribution and legal payload investigations of specific units; and (4) evaluation of the specifications and related information on the individual and integrated pieces of equipment.

The following paragraphs briefly describe the extent and nature of these investigations:

Initial Equipment Surveys: On December 30, 1970, the Department of Public Works mailed out questionnaires to 21 local and national equipment suppliers who were actively involved in manufacturing and selling solid waste collection systems. The questionnaire requested the individual companies to appraise their ability to manufacture an integrated system capable of serving both 8-cubic-yard bins and large 40-cubic-yard drop boxes and provide specific detailed information on the cost and operating characteristics of the understructure, compaction body and containers. Of these 21 companies, seven did not reply; 11 reported that although they manufacture the traditional, permanently mounted compaction bodies and hoist and tilt frames, they did not have the capabilities to produce a combined unit; and three reported in the affirmative. The three companies--Dempster Brothers, Incorporated, Knoxville, Tennessee; Bemars, Incorporated, Montebello, California; and S. Vincen Bowles, Incorporated, Sun Valley, California--supplied brochures, equipment descriptions, typical weights and costs, and names and addresses of agencies or companies presently utilizing their respective combined systems.

Field Demonstrations: Based on the results of the initial questionnaires and the interest displayed by the three potential equipment suppliers, field demonstrations of the individual units were arranged through the respective companies. These surveys were carried out by representatives of the Technical Advisory Committee including staff members of the Department of Public Works, Humboldt County. The purposes of these surveys were to evaluate the workability of the systems, obtain first-hand information on their operating characteristics and limitations, and document through movies and slides, their physical characteristics. The particular pieces of equipment demonstrated included:

1. A Bemar 40-cubic-yard detachable compaction body mounted on a cable operated tilt and dump understructure. The unit was owned and operated by the Anaheim Disposal Company, Anaheim, California, as a dual purpose standby unit for its commercial routes. It was 7 years old and mounted on a medium-sized three-axle chassis.

2. A Bowles 43-cubic-yard front loading fixed compaction unit and a cable operated tilt and dump truck. The units were demonstrators of the Northern California distributor, Sunnyvale Truck and Equipment Company, Sunnyvale, California, and comprised the component parts of a combination unit. All of their working combined units were being operated by private haulers out of the

State--COMPAC Refuse, Incorporated, Honolulu, Hawaii; Denver Clean Up Service, Denver, Colorado; and McCarthy Brothers, Philadelphia, Pennsylvania.

3. A Dempster 33-cubic-yard detachable front-end loader mounted on a hydraulically operated lifting and tilting understructure. The unit was relatively new, less than a year, and was operated by the United States Government at the Tracy Supply Depot, Tracy, California, as their primary refuse vehicle. It services 6-cubic-yard and 8-cubic-yard front loading containers, 20-cubic-yard and 40-cubic-yard drop boxes, and 55-cubic-yard stationary compactor units. The principal conclusions of these demonstrations were that:

a. The multipurpose collection vehicle was workable and offered the advantages of flexibility over two separate single-purpose units.

b. Its increased tare weight, above that of a permanently fixed front loader, and corresponding loss of legal payload was the principal problem and prevailing reason for the combination unit's lack of popularity.

c. There were striking and apparent differences between the three units in terms of design, construction, safety features, and durability. These differences were basically due to the respective companies established markets.

(1) Dempster Brothers' product was basically designed and built around the military market with the resulting unit being engineered down to the last nut and bolt, constructed of standardized parts and components, extremely durable with the ability to resist constant abuse, and incorporating some desirable safety features that are generally unavailable on cable operated units (ie., automatic container lock, nondependence on gravity unloading mechanism, and elimination of cable replacement problems). The principal disadvantages with their product were its price and weight.

(2) The Bowles and Bemar product lines, on the other hand, were built around the California private waste hauler market. This market dictates a highly competitive price structure, maximum payload, units individually tailored to the respective company's unique demands, and replacement of the unit within 4 to 7 years. The resultant product does an excellent job within the constraints imposed by the market demands, but care must be exercised in mating its intended use with its design characteristics. Its primary advantage lies in its ability to maximize payload.

Legal Payload Investigations: The third major activity centered around defining, within limits, the chassis requirements and legal payloads of the proposed multipurpose vehicles. This particular aspect was most vital in light of the findings that a medium sized truck chassis, normally associated with the solid waste industry, was found unsuitable for the terrain and grades prevalent in Humboldt County. This requirement acted as the catalyst for developing a comprehensive purchasing policy due to the weight and mounting problems associated with the large chassis. As a result, a second questionnaire was sent to the three interested equipment suppliers with preliminary specifications of three applicable chassis: the Peterbilt CB-300 and the Mack MB-4915 (medium size) and Peterbilt 352 (large size). It was later determined that the Peterbilt CB-300 could not be utilized due to engine requirements.

The equipment dealers were requested to provide a detailed load diagram for each chassis specifying their truck requirements (i.e., cab to axle length, wheel base, and rear axle to end of frame measurement) and component equipment loadings (i.e., center of gravities, total weight and weight distribution to respective axles). Although all three companies replied, their returns were generally incomplete in terms of conforming to the format and adequately detailing the requested information. In subsequent requests, it became apparent that the respective manufacturers had little experience in documenting the tare weight and center of gravities of their equipment; yet, any rational technique for aiding their customers in purchasing that specific chassis would maximize the "normal" legal payloads, utilizing their respective equipment. The reported legal payloads varied from 7,600 pounds to 14,200 pounds on wheel bases ranging from 201 to 216 inches.

Specifications Review: The last major activity was concerned with compiling and reviewing the individual manufacturers' specifications and requirements. The available information on the integrated units, individual components, and related accessories were studied and evaluated in light of their overall capability to perform the required tasks. It is significant to note that their respective specifications and related engineering material vary from an in-depth description of every major component to a brief mention of the entire unit.

Chassis Investigations. In conjunction with the body investigations, the county undertook a study of applicable chassis that could adequately transport the collection equipment over the roads and terrain of the proposed service areas. The county surveyed local equipment dealers, compiled the weights and pertinent specifications of trucks of the medium to large size class, and evaluated their applicability in light of the program's needs. Cognizant of the importance of selecting a chassis that would adequately traverse the terrain peculiar to Humboldt County, the Department of Public Works, at no cost through the cooperation of one of the potential equipment suppliers, road tested a legally loaded front end compaction unit mounted on a medium sized chassis. The outcome of these tests confirmed the county equipment personnel's recommendations that the standard medium sized trucks used in the solid waste collection industry could not cope with the 20 percent slopes typical of some of the rural containerized access highways.

Initial Assumptions: Respective representatives of each agency had assumed that the chassis investigations and requirements would be based largely upon current practices, except that power and drive-train requirements of the medium sized chassis would be given special consideration to insure the unit could adequately traverse the general road conditions imposed by the mountainous terrain prevalent in Humboldt County and other mountainous areas. Because of the above assumption, representatives of the Department of Public Works initiated an assessment of the alternate truck chassis components.

Initial Evaluations: During field evaluations of the respective body manufacturers' equipment, the Equipment Superintendent initiated evaluations of the medium sized truck chassis in connection with the following items: cab types and dimensions, transmission types, turning radius, chassis dimensions, and weight data.

These were determined by review of various truck manufacturers' brochures, meetings with respective sales manufacturing personnel, and discussion with current waste collectors in the local and more populous areas. Indications were that (1) front loader collection units would require a cab-over configuration; (2) an automatic transmission would be more suited to short or long trip requirements where the unit would be subject to frequent maneuvering for servicing containers; (3) maneuvering areas for serving containers is directly related to turning radii--optional axles were available to decrease required turning radii at a minimal extra cost; and (4) chassis dimensions varied between certain manufacturers of "standard" medium sized chassis due to placement of front axles and the type of engines utilized.

Initial weight calculations of the chassis, in relationship to the anticipated gross legal payload, as imposed by current California law, implied that the projected payload of the combined unit would be marginal.

The Equipment Superintendent, in evaluating the above data for the general road conditions, expressed concern (1) that the payload would be limited, and (2) about the ability of adapting or selecting engine and drive-train options for the needed chassis. He suggested that the large chassis types should be considered, as the large chassis could be developed with a comparable gross weight--the front axle of the large chassis was generally further forward and would allow a longer wheel base, resulting in a greater legal gross vehicle weight. Standard engine and drive-train options would be available for almost all payload terrain needs. The suggestion, however, was subject to the relationship of cab height and width relative to the front loading compactor body. Thus, a second questionnaire was forwarded to the three body manufacturers. Although the manufacturers' response to the questionnaire was incomplete, relative to weight distributions, project personnel determined that (1) the manufacturers of front loading compactors were opposed to mounting their unit on the large truck chassis cabs because "it was never done before"; (2) the effective payload on the large sized chassis would be equal to, or greater than, the payload of the medium sized truck; and (3) the service life of the optional engine and drive-train components available for the medium sized chassis would be limited due to operating ranges far in excess of normal practices.

Public officials expressed apprehension about developing a combined unit suited to the mountainous terrain. The large truck chassis appeared necessary for terrain conditions, yet the medium sized chassis would be required for the proper clearance of front loading compaction equipment.

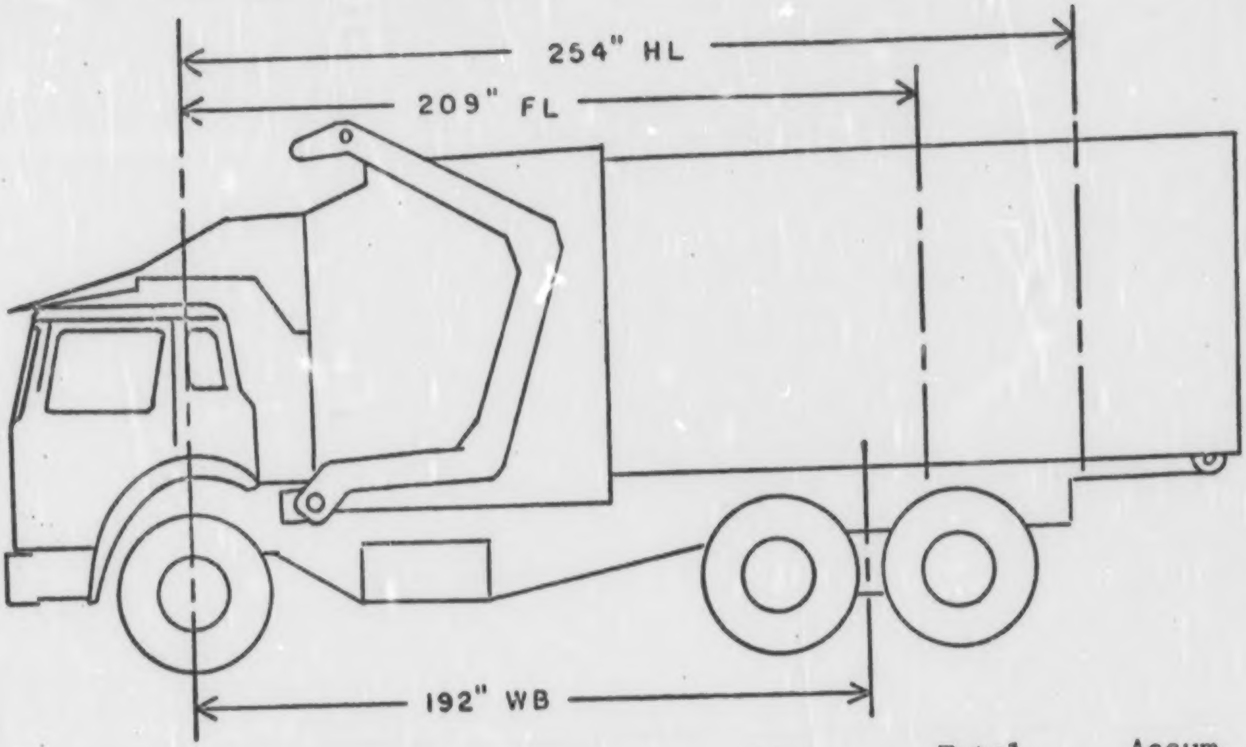
Field Demonstration: Sunnyvale Truck and Equipment Company, a distributor for International trucks and the Bowles collection equipment, had manufactured combined units for use in other states, and expressed a desire to perform active field demonstrations with a collection unit on a medium sized chassis they felt would be suitable for this terrain. The actual demonstration was performed with a theoretical payload based on anticipated tare vehicle weights and a "water level" load distribution. The truck specifications, tare weights, payload calculations, and actual weights are illustrated in Figure 11.

Although accurate records were not made on the maximum grades or fuel consumption rates, the following general observation was agreed to by the Equipment Superintendent and the salesman experienced with the area and trucking requirements.

On several 15-percent to 20-percent grades on the route between Garberville and Shelter Cover, the engine rpm dropped to 1,500 in low gear with an indicated speed of less than 3 miles per hour. Had the length of grades been any longer, the driver would have been required to shut off the engine (1,300 rpm for the particular diesel unit). Engine heating and brake fading were prevalent on several grades--brake fade on a long downgrade into Shelter Cover terminated the run for safety reasons. Subsequently, the agency indicated that the unit would be unsuited for terrain-load conditions unless equipped with a larger engine and a Jacobs engine brake.

The above demonstration supported the Equipment Superintendent's calculations and led to the following re-evaluations.

Re-Evaluations: Additional meetings with the truck and compaction body representatives, in light of the above findings, resulted in the following determinations: (1) one of the medium sized chassis manufacturers could adapt special optional equipment for the needed engine drive-train requirements; (2) two of the three collection equipment



		Front	Rear	Total	Accum.
Comparative roll off unit	Chassis	6,540	6,140	12,680	12,680
	Undercarriage	2,895	2,185	5,080	17,760
	Body	6,620	6,620	13,240	31,000
	Tare	16,055	14,945	31,000	---
	Theoretical Payload	1,945	17,055	19,000	50,000
	Legal Weights	18,000	32,000	50,000	---
Field demonstration unit calculations	Wt.Delivered	13,420	14,920	28,340	
	Add for Understructure	+2,635	+ 25	+2,660	
	Adjusted Tare	16,055	14,945	31,000	31,000
	Half Load	13,633	28,865	38,498	38,500
	Full Load	14,735	31,273	46,008	46,000
Actual field demonstration	Gross Weight	13,380	33,420	46,800	

Figure 11. Load distribution of field demonstrator (medium sized chassis).

manufacturers agreed that they would be able to adapt their units to a large truck chassis, contingent upon detailed dimensions of the cab area.

Finalization of Specifications: The use of the required 300 horsepower range with a Jacobs engine brake and the additional weight needed for the front axle, dictated the loss of the automatic transmission and the minimum turning radius available on light axles. (Note: Many manufacturers will sell lightweight axles--6,000 pounds, 12,000 pounds, etc., for cab-over units that may carry a gross axle weight at maximum legal load [18,000 pounds] --Safety aspect was not explored).

Tare weights, cab dimensions, and other minor chassis requirements were then finalized during meetings with the respective truck manufacturers.

Bidding Procedures. In reviewing the purchasing policies prevalent throughout the solid waste industry it became apparent that little, if any, thought was given to the marriageability of the compaction body and the basic chassis, except within the general cab-to-trunnion guidelines suggested on the body manufacturers' brochures. The units are normally integrated on the basis of least cost, familiarity with specific models or type, fleet consistency for purposes of maintenance and inventory control, presence of local outlets or distributors, or any number of other reasons. The point is that the selection criteria excluded the key determinant--the unit's legal carrying capacity. The lack of concern by the operator was generally attributed to his belief that regardless of the particular chassis utilized, his legal payload would be fairly consistent.

In our studies and those of the Los Angeles County Sanitation District (*) we found that "most of the collection vehicles in use today do not have good axle location and weight distribution and, as a result, reach maximum axle loading on the rear axle (or axles) before reaching maximum legal load on all axles."(+) For instance, a common body type mounted on numerous chassis (i.e., White, International, Mack, Ford, G.M.C., etc.) with the identical wheel bases would not necessarily

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(*) Performance Records of Various Types of Refuse Collection Equipment by Raymond Grier, Associate Civil Engineer, Los Angeles County Sanitation District.

(+) 1968 Proceedings of the Sixth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, Fresno, California, November 7-9, 1968. p. 114-123.

produce the same axle weights under tare conditions or the same legal payloads under theoretical load conditions. This deviation is due to California's particular weight laws and a lack of appreciation, on the part of the solid waste industry, of the need to consider the unit as a single entity rather than a combination of two independent components.

The legal payload of collection vehicles in California is fixed by two mutually dependent standards. The first limitation is the vehicle's gross weight which is fixed by the Bridge Formula and the unit's wheel base. The second limitation is the vehicle's individual axle loadings fixed at 18,000 pounds. It is important to note that one can be within the first limitation but over the second; thus, indicating the overriding importance of properly distributing the tare weight of the body and the in-place weight of the load to maximize carrying capacity.

The weight of the waste and the basic equipment loads, including the understructure, compaction body, and miscellaneous components, are transmitted to the axles in relation to the distance between the axles and the item's respective center of gravity. This distance in turn, is generally dictated by the mounting requirements, peculiar to that specific chassis, particularly cab dimensions and the resulting cab-to-trunnion measurements. Since individual chassis manufacturers vary the effective front axle to rear of cab dimension inclusive of required clearance tolerance for engine mountings, it should be apparent that one can have identical wheel bases (defines gross weight limitation), but different axle loadings. On the other hand, the alternate body types, as well as each specific manufacturer's product, vary in their dimensions, construction and resulting tare and load distribution characteristic; no two specific bodies will transmit the identical tare and theoretical waste loads to the same respective axles. The combination of these load variables presents a complex and little understood picture with the actual axle loads varying over a wide band. Thus, there exists a need for equipment purchasers to analyze, on a chassis-by-chassis and body-by-body basis, the tare weight characteristics and the percentage of total actual payloads transmitted to the respective axles. Legal carrying payload and actual effective payloads can only be equated and maximized if the correct selection of cab and chassis, axle location, tires, and compaction body are properly mated to the waste characteristics. However, this approach on a theoretical basis dictates the development of a sound data base, interrelating (1) the probable center of gravity of "normal" loads based on statistical concepts; (2) the compaction pressures and ratios of these so-called "normal" loads per various body types and manufacturers; and (3) the solid waste mix, moisture, and compressibility of the user's uncompacted waste.

In light of the scarcity of engineering data on the above variables and the technical effort required to define the resultant actual in-place load characteristics, we limited our investigations to the theoretical payloads for selected, properly mated truck and body units. Specifically, we concerned ourselves with the mathematical difference between the lesser of (1) the "legal gross weight," as defined by the California Vehicle Code, minus the cumulative tare weight of the equipment components, as defined by the respective manufacturers; or (2) the "legal axle loadings," as defined by the California Vehicle Code minus the effective axle loadings, based on the distribution of the equipment component weights per the respective manufacturers, and the legal payload as defined above (Item 1). In our subsequent efforts, we attempted to incorporate axle loadings for the equipment components and theoretical legal payloads into the decision-making process.

Conclusions - Investigations. The following statements summarize the results and findings of the above investigations and review procedures.

Collection Equipment:

(1) There are only three equipment manufacturers that can provide integrated units capable of performing the dual tasks of serving both the front loading and drop box type of containers with existing and historically tested equipment.

(2) There are major and apparent differences in the units demonstrated in terms of design, construction, strength, capacity, first cost, maintenance requirements, safety, and probable life spans.

(3) The individual body manufacturers have specific and different requirements for mounting their units, including maximum permissable cab width and height, maximum clearance between the compaction body and cab, and maximum frame height to maintain legal height restrictions.

(4) The three body manufacturers provide a wide range of options and special features particularly designed for their units that affect their overall weight and workability. Included are partial and full push-out systems, single and barn-type door construction, and accordian and pivoting hopper covers. Proprietary items include tilting frame modification permitting loading and unloading of two drop boxes, barn-type discharge door for compaction body, and container modification permitting servicing from either end.

Chassis Requirements:

(1) The motor and braking requirements of the terrain dictate the use of a heavy-duty chassis to accommodate an engine in the 300 horsepower range and a Jacobs engine brake.

(2) The chassis manufacturers that produce units compatible with these general requirements (i.e., International, Peterbilt, White and Mack) vary widely in terms of usable cab-to-trunnion measurements, cab height and width, top of frame measurement, and wet weight.

(3) This type of truck is not normally used in combination with a front-end loader due to its large cab and therefore will present a number of unique problems.

Interdependence of Body and Chassis:

(1) There is an obvious and significant interdependence of the body and chassis requirements in achieving a balanced design at minimum cost. Their mutual dependency is particularly manifested in terms of the combined units overall workability, legal payload, costs, and use of standard and nonstandard components.

(a) Payload--the ability to obtain a workable and legal payload for the combination unit, remains one of the key success determinants of the project. If a payload of 10,000 to 16,000 pounds is to be maintained on the large chassis, the multipurpose vehicle must be considered as a single unit rather than two major components.

(b) Standardization--the three body manufacturers have reported that they will be able to mount their standard units on at least one of the recommended chassis, not necessarily a common one, but that they will not be able to mount their units on others without major modification and redesign. The disadvantages of such an approach are evidenced in terms of payload reduction, additional costs, and the use of nonstandard and nontested components.

(c) Total System Cost--the total package cost of the multipurpose units are inherently linked to the compatibility of the chassis, understructure, compaction body, and containers. The selection of the components on an individual cost basis could present severe and perhaps insurmountable problems in fitting the units together.

(2) The inherent differences in construction procedures and mounting techniques of the body manufacturers and the interest and existing production backlog of the chassis manufacturers, will cause major variances in contract delivery time. Preliminary discussions with the respective suppliers indicated that delivery time will range from 60 to 120 days for the chassis and an additional 30 to 90 days for the understructure, compaction body, and containers. Selection of the applicable equipment without serious consideration for these factors would have caused severe problems in the administration and funding of the project.

Purchasing Policy. The diversity in the manufacturers' products, the interdependence of the individual components, the restrictions of legal weight and height limitations, and the critical nature of delivery time, dictated an approach that would not tie the county to a standard bid price quotation on the individual components. It was recommended that by selecting and purchasing the component equipment on the basis of bid proposals incorporating cost, delivery time, dependability, payloads, standardization, and marriageability of the body and chassis, the county could obtain an integrated unit that was best suited to its needs, offered maximum flexibility, and was within the time and cost constraints of the Federally sponsored project. This was accomplished on a nondiscretionary basis by clearly informing the bidders, at the time of solicitation of bids, of the county's intentions to purchase the units on the above criteria.

It was in this light that the Department of Public Works requested and received authorization from the Board of Supervisors, to prepare the necessary bid documents and solicit quotations from the respective manufacturers. The authorization enabled the Director of Public Works, his representatives and the purchasing agent to advertise, solicit, receive and evaluate the bid proposals along the lines delineated above. The specific pieces of equipment included within the authorization were (1) two collection vehicles including chassis and understructure; (2) one front loading compaction body; and (3) 35 containers (five 40-cubic-yard drop boxes, two 20-cubic-yard drop boxes, and 20 8-cubic-yard bins).

The suggested criteria for selecting and purchasing the recommended components included:

Chassis:

(1) Total chassis weight inclusive of specified items.

(2) Bid prices exclusive of Federal taxes.

(3) Delivery time of completed chassis to body manufacturers' facility (Los Angeles, California, or Knoxville, Tennessee).

(4) Compatibility with alternative compaction units.

Collection Equipment:

(1) Minimum guaranteed controlled payloads on specific truck models. Contractor was required to document axle loadings, gross weight, and center of gravity of the understructure, compaction body, and associated equipment mounted on said chassis.

(2) Unit and total bid prices, inclusive of transportation cost to Eureka, of supplying an integrated system. Contractors were requested to supply three alternative sub-bids on the containers, inclusive of unit costs, fabrication time, and weights, if subbidders were available.

(3) Delivery time of completed units to Eureka, California, from date of acceptance of chassis.

(4) Standardized and/or customized features. Contractor was required to detail all nonstandard components or modifications.

(5) Compatibility with alternative chassis.

Bid Proposals. The bid documents were prepared for the chassis and associated containerized collection equipment utilizing the approved proposal concept rather than standard competitive bidding procedures. This approach enabled the county to solicit quotes on the component parts of the multi-purpose solid waste collection vehicle to insure the purchase of an integrated unit best suited to the project's needs. The proposals were prepared in two distinct packages, for the chassis and the collection equipment respectively, and included bid submittal forms, instructions to bidders detailing method of award, and detailed specifications. The Department of Public Works and the consultant jointly prepared these documents; the county provided major input for the truck chassis sections and those sections detailing statutory bidding requirements. They were mailed simultaneously on May 28, 1971, to the respective parties, with clear instructions that they be returned to the purchasing agent, Humboldt County Courthouse, Eureka, California, by 10:00 a.m., June 21, 1971.

The proposals were to be accompanied by a 10-percent security deposit and specifically point out all exceptions to the specifications and bid forms. At such time, the Director of Public Works and the purchasing agent were to receive, open, and make public the contents of all proposals. Those proposals that explicitly conformed to the bidding requirements were to be compiled and evaluated and that combination of component parts that represented the best combined system was to be purchased following approval by the Board of Supervisors.

Collection Equipment - Procedures: The bid documents for the two understructures, one compaction body, and the required containers were submitted to the following three manufacturers who had indicated a historical capability of manufacturing a combined roll off compaction body and drop box unit.

- Dempster Brothers, Incorporated
  Knoxville, Tennessee

- S. Vincen Bowles, Incorporated
  Sun Valley, California

- Bemars, Incorporated
  Montebello, California

To insure that the bid proposal package was clearly understood and acceptable to the respective manufacturers, in terms of allocated time (approximately 3 weeks) and man-hours to develop the required designs, weight data and costs, the following procedures were employed:

(1) Each manufacturer was requested to forward all pertinent documents relating to their particular equipment, including brochures, specifications, pertinent data, photographs and price guidelines.

(2) Following the development of preliminary specification and bid format, in-depth discussions were held with the respective manufacturers. These discussions included a review of the aims and goals of the project, the geographical and trucking constraints, and a detailed review of the above documents. The manufacturers were asked to review, correct, and alter all specific sections that either were not compatible with their standard equipment or that related to proprietary items of other manufacturers. The outcome of these meetings was very rewarding. The companies assured the consultant that the bid format and the allocated time (3 weeks) were reasonable and that bids would be submitted in accordance with same.

(3) In finalizing these documents, the manufacturers' specific comments and needs were considered. All three manufacturers comprehensively reviewed the documents and forwarded page-by-page comments to the consultant.

(4) During the 3-week bid time, the manufacturers were contacted twice to assure the county that the bids would be received in time and in conformance with instructions: once immediately following advertisement to assure receipt of bid package, and once the week before opening date to remind respective companies of the deadline.

Collection Equipment - Bid Documents: The bid documents for the collection equipment were designed to accomplish the following:

(1) The bid form was to define all unit and total prices for base bid items, modifications, and options and identify those modifications or optional items that could not be utilized with bidder's equipment.

Section A: Base Bids - Identify the unit and total prices of the contractor's standard off-the-shelf components (understructure, full pack compaction body, 40-cubic-yard drop boxes, 20-cubic-yard drop boxes, and 8-cubic-yard containers) that are compatible with conventional cab-over medium sized chassis and the previous specifications.

Section B: Modifications - Define the specific dollar amount for the contractor to integrate, utilize, and/or adapt his standard equipment with each of the seven conventional cab-over, large sized chassis, including possible modification of front loading assembly, compaction body, understructure and containers.

Section C: Optional Items - Identify the costs for providing those specified optional items that are compatible with contractor's equipment. These items generally included the proprietary or optional items.

Section D: Maximum Delivery Time - Specify the maximum number of consecutive calendar days, from date of receipt of chassis, to fabricate, install, test, and deliver all equipment to Eureka, California.

Section E: Alternative Base Item - Define the price variance for providing an alternative detachable partial pack compaction body and front loader in-lieu of specified full pack. Since this item was proprietary to two companies, it was not within the county's selection criteria and could not alter third bidder's competitive position.

(2) The payload tabulations were to develop individual axle loadings and dimensional requirements for each of the seven competitive chassis to evaluate probable normal payloads if these units were integrated. The bidder was further asked to estimate the maximum deviation of the loadings from final production weights, which included his experience or nonexperience with particular chassis. If a particular chassis dictated use of nonstandard components, the bidder was to define anticipated modifications.

(3) The weight and dimensional tabulations were to define the net usable volume, total weight and net usable lid opening of containers, based on bidder's anticipated design and attached specifications. Also the weight variance for specified optional and alternative items.

Collection Equipment - Specifications: The pertinent and key design characteristics of the collection equipment specifications are summarized below:

Scope

Furnish and install on truck chassis a tilting frame unit complete with hydraulic system for loading, manipulation, and unloading detachable compaction body, and on-off type waste containers.

Furnish and install front loading type compaction body complete with hydraulic system.

Furnish 8-cubic-yard, 20-cubic-yard, and 40-cubic-yard solid waste containers compatible with above systems.

Furnish and install cab mounted and (optional) remote controls for hydraulic systems.

Furnish and install (optional) 50-gallon capacity water storage and container wash system.

Types A and B containers (Detachable body type, 40-cubic-yard nominal capacity). Body shall be functionally compatible with the truck and tilting frame unit; shall be box shaped (maximum 22 feet long, 8 feet wide, and 8 feet high with rollers); shall have two removable, reversible, closed top, spring counterbalanced lids with stops, that open or close with an applied force of 5 pounds and provide a clear opening of at least 80 percent of the horizontal cross-sectional area of the body; shall have a single or (optional) double ended understructure permitting the container to be picked up from either end.

Type C containers (Detachable body type, 20-cubic-yard nominal capacity). Body shall be functionally compatible with the truck and tilting frame unit; shall be box shaped (maximum 22 feet long, 8 feet wide, and 4 feet high with rollers); shall have a heavy canvas tarpaulin cover and hook system.

Type D container (lift-up type, 8-cubic-yard capacity). Container shall be completely compatible with front loading compaction unit; shall be box shaped (nominal 68 inches long, maximum 72 inches wide, and nominal 82 inches high); shall have three closed top lids with innerlid providing at least 80 percent of the horizontal cross-sectional area of the outer lid. Loading lid shall be closed top, spring counterbalanced, to open and close with an applied force of 5 pounds.

Compactor. The compactor shall be the front loading type with loading arms with compactor and ejection plate of the full pack type or alternative partial pack type. Provision for preventing the load from shifting forward during transportation shall be included. Capacity of the body shall be not less than 30-cubic-yards. Compression chamber capacity shall be not less than 10-cubic-yards.

Tilting frame unit. The tilting frame unit, mounted on the truck chassis, shall be capable of handling all types and sizes of bodies (excluding 8-cubic-yard containers); shall be provided with automatic locks for securing the detachable bodies while in transit; shall be capable of lifting the frame and loaded body to an angle of not less than 45 degrees from the top of the chassis frame; shall have relief valves to prevent excessive pressure buildup.

Quality assurance provisions. Each container, including first production unit, shall be examined for compliance with the requirements specified in these specifications. The body hoisting mechanism and compaction unit shall be tested to assure complete functional operation. The vehicle loaded to the maximum specified shall be road tested.

Supplier shall furnish dimensional fabrication type drawings for approval of the container bodies, lids, hinges, latches, counterbalance mechanism, and unloading doors.

Contractor shall furnish for approval specifications for locking device to insure permanency of compaction body and roll-off boxes during transportation.

Responsibility for integration. Contractor shall be held responsible for integrating the individual components into a well balanced and workable unit. Failure of the understructure, compaction body and front loader, and containers to work as a single unit and offer normal road stability or to meet the requirements of the contract shall be cause for rejection of said components.

Truck Chassis - Procedure: The finalized bid documents were submitted to all interested representatives of the following truck manufacturers: (1) Chevrolet - Titan 90; (2) General Motors - Astro 95; (3) International Harvester - COF 4070A; (4) Mack - CA 50; (5) Mack - MB 491S (medium sized truck); (6) Peterbilt - 352; and (7) Kenworth - K 123.

To insure compliance with the proposed form, a cover letter explaining the reasons for the proposal format, rather than a normal bid purchase procedure, and a set of instructions for completing the proposed forms were forwarded to all manufacturers. In addition, each representative was apprised of the format during meetings.

Truck Chassis - Bid Documents: The bid documents for the truck chassis included a submitted form, a set of instructions, dimensional definitions, the specifications, and a required proposal form. The documents were designed to insure that each manufacturer would be allowed and/or required to:

(1) Note exceptions to the listed specifications for the frame, engine, transmission, or cab that might be unavailable on the manufacturer's unit.

(2) Specify the truck model and the road ready weights of the unit (not to exceed maximums set forth).

(3) Specify cab model, chassis dimensions, and turning diameters.

(4) State the price delivered to body manufacturers.

(5) Provide for alternative components for increased weight reduction below maximum allowable (optional--not a part of base bid).

(6) Indicate the delivery time (limited to maximum time set forth).

(7) Include an addendum on air conditioners.

Truck Chassis - Specifications: The specifications for the truck chassis encompassed the specific items available for the basic unit along with the optional convenience items needed for a usable operating unit.

Evaluation and Selection of Bids. On June 21, 1971, the purchasing agent, County of Humboldt, opened all chassis and collection equipment bids that had been received in his office by 10:00 a.m, as per the bid instructions. To the county's dismay and displeasure, only five chassis and one body representative submitted proposals; of these, two chassis bids had to be automatically eliminated due to the manufacturers' reluctance to attach the required bid bond. Subsequent discussions with the other two acceptable body manufacturers revealed that they had completed and mailed their proposals, which were not received at the Humboldt County Courthouse until Tuesday and Wednesday mornings (June 22 and 23).

At the staff's request, the purchasing agent held the sealed proposals pending the County Counsel's opinion regarding the legality of accepting them on the basis of the postmark date, rather than the date delivered to the County Courthouse, as per the bid instructions. Although the County Counsel was aware of the project's unique nature, the critical time factor, and the limited eligibility of solid waste equipment manufacturers, he believed that the acceptance of the two late bids would constitute a legal discrimination against the bidder that had taken the necessary precautions against such a possibility, by hand delivering the bid. It was, therefore, his legal opinion that the county could only reject all the proposals or award the contract, per the selection criteria, among those proposals received within the time constraints imposed by the bid instructions.

In that the single qualified body manufacturer and the related applicable truck chassis substantially satisfied the minimum established guidelines and in an endeavor to maintain original time schedules and implement the collection operations before the end of the calendar year, the staff recommended that the county pursue the latter alternative and select and purchase the waste equipment from the qualified bidders. Thus, the developed selection criteria for insuring the purchase of the best integrated waste collection equipment in terms of combined cost, theoretical payloads, equipment standardization, and fabrication and delivery period were never applied.

The selection of the particular truck chassis from among the three qualified bidders was based on their bid price, road ready weights, delivery time, and compatibility with the collection equipment (S. Vincen Bowles, Incorporated). Table 4, Summary of the Solid Waste Collection Truck Chassis Proposals, presents the results of the truck chassis' proposals and delineates the specific criteria referred to above. Of the eight interested chassis bidders, three did not bid at all (Chevrolet Titan 90, Mack MB 491S, and Kenworth K-123), and two failed to attach the required bid bond (General Motors Astro 95 and Peterbilt 352). The remaining three qualified bidders included two separate bids for the International Harvester COF 4070A (two different distributors) and a bid for the Mack CA-50. A subsequent review of the Mack CA-50 chassis indicated that effective front axle to cab distance of their standard cab employing the specified power unit precluded the use of the body manufacturer's standard front loader. Thus, the selection of the most applicable chassis was limited by default to the International Harvester COF 4070A.

It is interesting to note that the two qualified bidders for this distinct chassis presented different prices, road ready weights, and delivery time (Table 4). The variance in bid price logically reflects a different profit margin; the variance in road ready weight and delivery time are unique in that the distributors have little, if any, control over

TABLE 4

SUMMARY OF THE SOLID WASTE COLLECTION TRUCK CHASSIS PROPOSALS

Chassis no.	Make & model	Required security deposit	Price for 2 units delivered to Los Angeles	Selection criteria				Delivery Time (days)
				Compatability with collection equipment bid	Road ready weights (lbs.)(1)			
					Front axle	Rear axle	Total	
1	Chevrolet Titan 90	NOT BID						
2(2)	GMC Astro 95	Not attached	$47,495.00	Undetermined	8,524	6,730	15,254	120
3	International Harvester (A) COF 4070A	Bond	45,624.88	Yes	8,275	6,716	14,991	125
3	International Harvester (B) COF 4070A	Bond	46,000.00	Yes	8,038	6,416	14,454	110
4(3)	Mack CA-50	Check	42,724.00	Noncompatible	8.373	7,064	15,437	120
5(4)	Mack MB491S	NOT BID						
6(2)	Peterbilt 352A	Not attached	47,692.00	[illegible]determined	7,875	6,875	14,750	90
7	Kenworth K-123	NOT BID						

(1) Road ready weights reflect contractor's estimated factory weight variance as follows: GMC-none; International (A)-3%; International (B)-2%; MACK-1%; Peterbilt Co.-none.

(2) Bids disqualified and not evaluated - submitted without the required security deposit.

(3) Noncompatible with collection equipment-waste collection equipment bidder did not bid mounting his unit on this chassis due to his inability to acquire sufficient dimensional data to determine compatibility of units. Additional evaluations by bidder at county's request determined the noncompatibility of the unit.

(4) Mack Truck Distributors did not bid this unit due to the lower cost of the larger Mack CA-50 although the county had clearly and specifically informed him of the need to bid both units so one of the three body manufacturers (Dempster Bros.) would not arbitrarily be excluded.

these variables. The units, regardless of sales channel, would be designed and fabricated by the factory per our specifications; their ultimate road ready weight and delivery time would therefore have to be identical in either case. The bid differences were attributed to (1) a reliance or nonreliance on factory estimates; (2) a lack of continuity on the part of the factory engineering department in supplying the distributors with accurate data; and (3) a varying degree of effort on the part of the distributors' sales staff in working with the factory to assure themselves that the bids realistically reflected the specifications and detailed selection criteria.

In light of these factors, it seemed redundant to apply criteria developed to differentiate between a set of alternatives to a set of theoretically identical choices. The logical criteria should be based on the only "effective" variable--the net costs to the county including probable penalty fees, as per the bid instructions, for anticipated weight and time overages. This approach, however, dictates the use of undefendable, although potentially valid, subjective considerations and assumptions. A legal requirement within the proposals on maximum limitations on specific items for consideration of proposals (weights, delivery time) was exceeded by all bidders and precluded application of the criteria for bid evaluation. The staff thus recommended that the county purchase the truck chassis on the basis of price alone.

Award of Contracts. The awards for the waste collection equipment and the truck chassis were authorized by the Board of Supervisors on June 24, 1971, in line with the above staff recommendations. The Notification of Award was forwarded to the Sunnyvale Truck Equipment Company (collection equipment) and T. & J. Garage Company (chassis) on July 21, 1971, following approval of the Office of Solid Waste Management Programs. Table 5, Summary of Bid Awards and Budget Allocations, lists the specific items purchased and their related costs. The waste collection equipment and truck chassis awards totaled $98,798.15, some $7,500 less than the budgeted amount.

The specific characteristics of the integrated waste collection vehicle and related equipment purchased include:

Chassis (2):

Type - International COF-4070A.
Maximum Gross Vehicle Weight - 50,000 pounds.
Maximum Gross Combination Weight - 79,000 pounds.
Wheel Base - 218 inches.
Frame - 10-1/2 inch by 1/2-inch web, heavy aluminum frame with steel cross members.
Engine - 8V71 N290-horsepower Detroit Diesel Engine equipped with Jacobs Engine Brake
Cab - 50 inches BBC aluminum cab-over.
Front Axle - 18,000 pound minimum with hydraulic power steering and heavy duty front springs.

TABLE 5

SUMMARY OF BID AWARDS AND BUDGET ALLOCATIONS

Waste collection equipment: Sunnyvale Truck and Equipment Company, 755 North Mathilda Avenue, Sunnyvale, California 94086--Northern California Distributors for S. Vince Bowles, Inc., Sun Valley, California

Base Items	Cost
Understructure (2)	$ 9,445.46
42-cubic-yard detachable compaction body and front loader (1)	12,319.09
40-cubic-yard drop boxes (5)	12,990.00
20-cubic-yard drop boxes (2)	3,912.00
8-cubic-yard drop boxes (20)	8,500.00
	$47,166.55
Optional items	
Wash water system* (1)	300.00
Outside controls (2)	264.00
Double-ended understructures for 40-cubic-yard drop boxes	875.00
Alternate partial pack compaction body in lieu of standard full pack (1)	(900.00)
	$ 539.00
5% sales tax	2,385.28
Total purchase price	$50,090.83

Truck Chassis: T & J Garage, Inc., 755 North Mathilda Avenue, Sunnyvale, California 94086, authorized distributors of International Harvester Company, Inc.

Truck chassis - International Model No. COF 4070A (2)	$45,624.88
Air conditioner (2)	763.04
5% sales tax	2,319.40
Total purchase price	$48,707.32
Total waste collection equipment and truck chassis awards	$98,798.15
Total budgeted	$106,300.00

*Wash water system mounted on compaction body, not chassis.

Rear Axle - SQHD Timken 38,000 pound with road geared speed not to exceed 55 miles per hour.

Suspension - 38,000 pound capacity RSA Hendrickson rubber load cushion rear suspension with heavy duty aluminum equalizer beams.

Transmission - Five-speed synchromesh with fifth speed direct drive.

Auxiliary Equipment - Right and left rear view mirrors with heaters, heavy duty front end tow hoods, electric backup type horn alarm, air horn mounted on cab roof, and cab air conditioner.

Guaranteed Performance Under Gross Load Conditions Per California Legal Load Limits - 10 miles per hour on 15-percent grade, first class highway and on 8-percent grade packed gravel road (Figures 12 and 13).

Understructure (2):

Type - Bowles standard hydraulic tilting frame and cable winch pull-on system.

Capacity - 30,000 pound maximum gross lifting capacity including container and payload.

Operation - Capable of servicing drop boxes from 16 to 22 feet long and compatible detachable front loaders; will mount, secure during transit, and unload units.

Design - The tilting frame consists of a heavy structural frame hinged at the rear for hoisting, with rollers on each side to support detachable bodies, automatic roller locks at front, automatic side locks to hold container rails to frame, double acting hoist cylinders capable of raising the frame to approximately 45 degrees and with hydraulically operated winch to pull detachable body on frame.

Hydraulic System - Power is transmitted from a transmission mounted power take-off through a high performance vane-type pump. Relief valve equipment prevents excessive pressure, and the size, volumetric capacity, and pressure rating of all components is calculated to assure smooth and efficient operation of the system.

Intersystem Connection - Quick disconnect hydraulic couplings are provided at the rear of the frame for pressure and return lines to the detachable body hydraulic system.

Controls - Hoist and winch operation is accomplished by engaging the power take-off and operating hydraulic directional valve levers located at the front of the frame on the driver's side by the cab.

Retaining Device - A mechanical brake device prevents winch movement if the power is disengaged during pull-up and set-down operations.

NOT REPRODUCIBLE

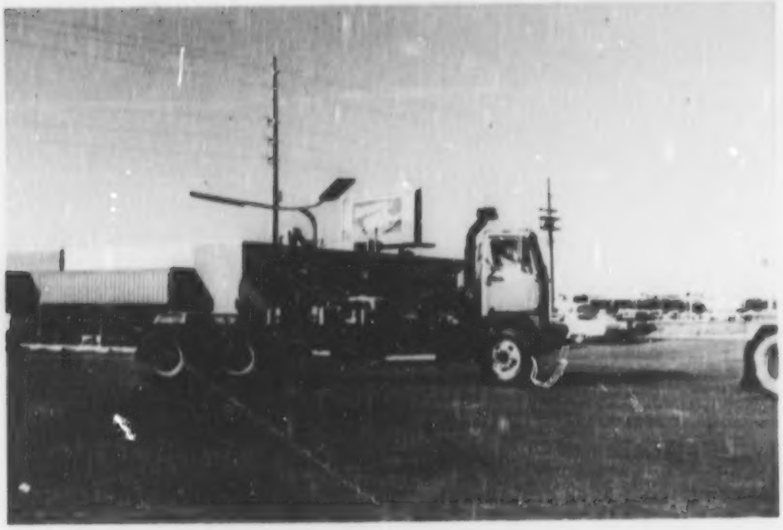

Figure 12. Truck chassis (International).

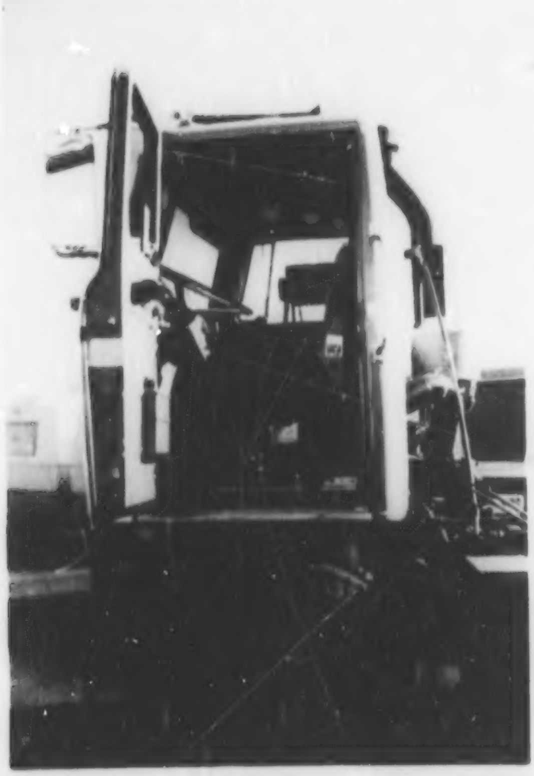

Figure 13. View of truck chassis (International) showing cab interior.

Body Locking Device - Automatic roller locks at front and automatic locks at rear securely hold on- and off-units (Figure 14).

Detachable Front Loading Compaction Body (1):

Type - Bowles standard detachable front loading compaction body capable of being loaded and operated on a Bowles tilting roll-off frame.
Capacity - 22 feet partial-pack 42-cubic-yard capacity.
Operation - Capable of hoisting and emptying 1-cubic-yard to 8-cubic-yard storage bins into hopper, where a compaction blade will sweep the waste towards the rear of the body.
Packer Body - Steel design capable of withstanding normal compaction pressures; hopper floor 1/4-inch sheet steel; body floor and side walls below guide rails 10 gauge; body top and side walls above guide rails 12 gauge; exterior body posts to reinforce sides; hold back teeth to retain load during transit.
Packer Blade - First stage cylinder exerts 70,000 pounds or more of horizontal thrust and travels a minimum of 6 inches beyond rear of hopper opening.
Hopper Cover - Horizontal type mounted on guides and operated by hydraulic cylinders.
Front Loader - Capable of hoisting 6,000 pounds (container and waste) into hopper with relief valves to prevent overloading; arms shall be over-door type.
Discharge Door - Barn-type door fitted with heavy duty hinges, safety chain, and single safety type lock and handle (Figure 15).

40-Cubic-Yard Drop Box (5):

Dimensions - 22 feet long, 8 feet wide, 8 feet high.
Weight - 9240 pounds.
Lid Opening - 65 square feet (Figure 16).

20-Cubic-Yard Drop Box (2):

Dimensions - 22 feet long, 8 feet wide, 4 feet high.
Weight - 5560 pounds (Figure 17).

8-Cubic-Yard Container (20):

Dimensions - 5.5 feet long, 6 feet wide, 8 feet high.
Weight - 1480 pounds.
Lid Opening - 18.2 square feet (Figure 18).

The integrated chassis body load and dimensional characteristics are included in Figure 19.

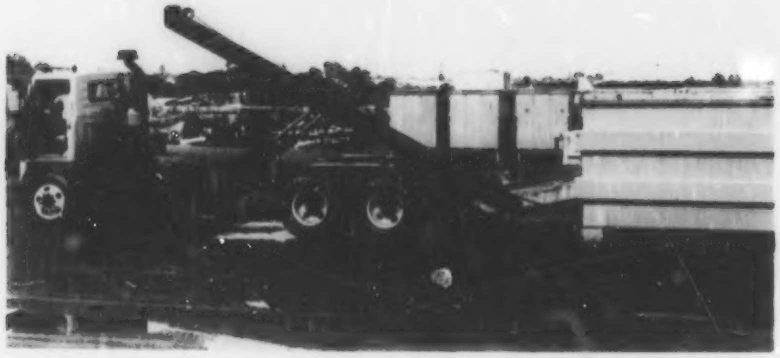

Figure 14. Bowles tilting frame and cable winch pull-on system.

NOT REPRODUCIBLE

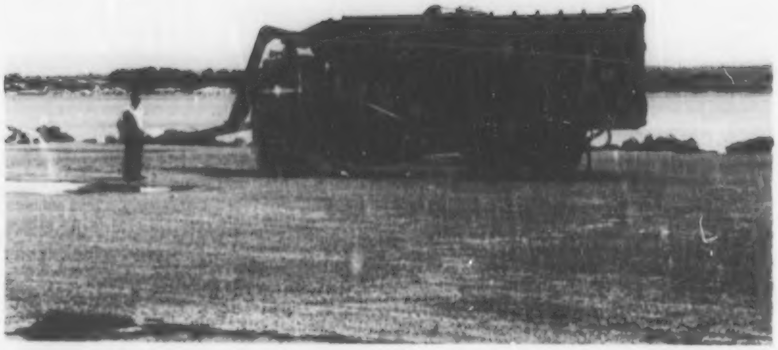

Figure 15. Bowles 42-cubic-yard detachable front loader.

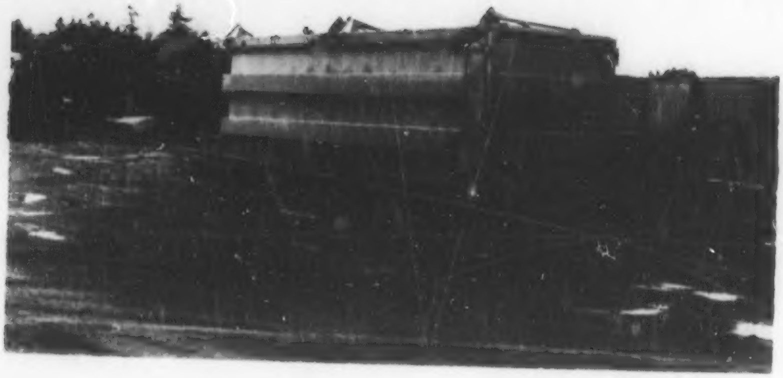

Figure 16. Forty-cubic-yard drop box.

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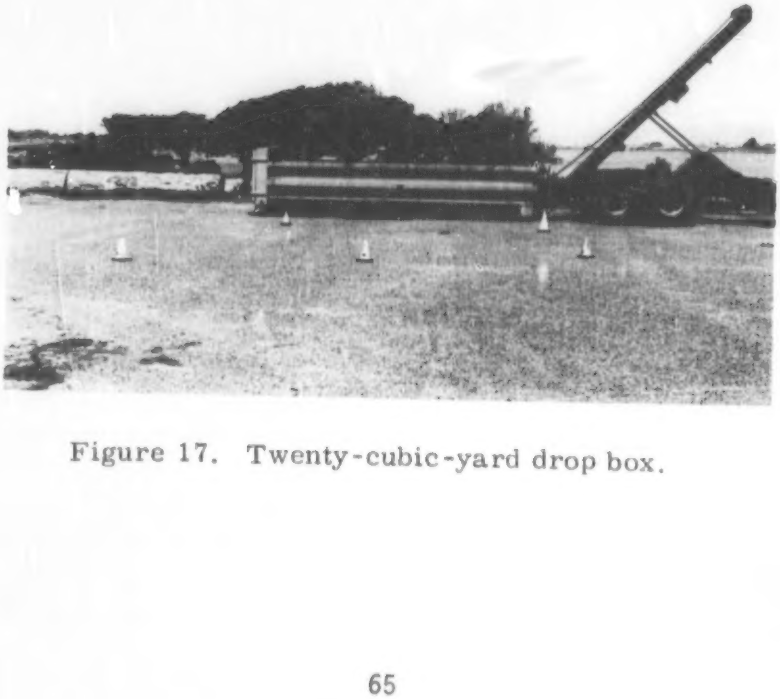


Figure 17. Twenty-cubic-yard drop box.

NOT REPRODUCIBLE

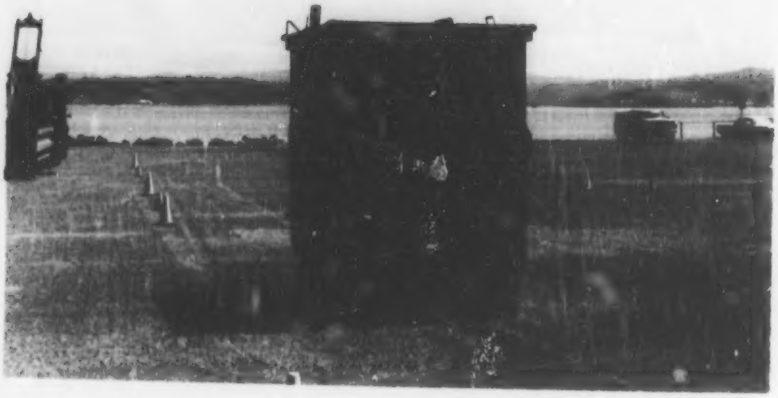
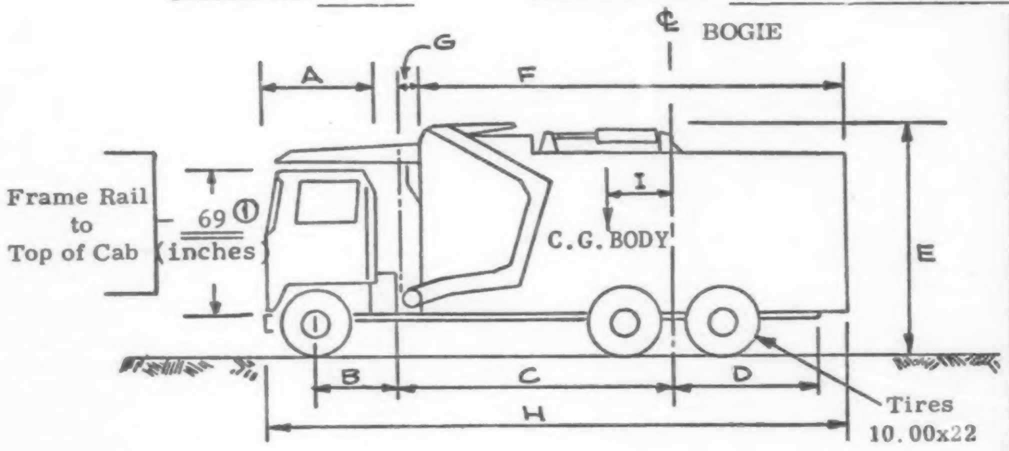


Figure 18. Eight-cubic-yard container.

Chassis No. 3 Make and Model International Harvester COF 4070 A



REFERENCE	DESCRIPTION	DIMENSION (inches)
A.	Overall BBC	50
B.	Effective front axle to end of cab	38
C.	Usable cab to trunnion requirements	178
D.	After-frame requirements	56
E.	Maximum overall height	161
F.	Overall body length	274
G.	Cab clearance requirements	3
H.	Overall unit length	348

SPECIFIED AXLE LOADINGS

		FRONT AXLE (pounds)	REAR AXLES (pounds)	TOTAL (pounds)
Chassis	①	8,275	6,716	14,991
Understructure	②	1,680	3,360	5,040
Front Loader	③	5,310	9,210	14,520
Controlled Payload		935 ④	12,514 ④	13,449 ⑤
Legal Gross Vehicle Weight		16,200	31,800	48,000 ⑥

---

(1) Maximum road ready weight per bid (includes 1035 pounds of fuel and 3 percent permissible weight variance).

(2) Weight of unit, exclusive of chassis, ready to roll (per bid).

(3) Weight of detachable front loader with packing blade and lifting arms in traveling position, inclusive of hydraulic fluid.

(4) Distribution of gross controlled payload to respective axles on the basis of water level load.

(5) Mathematical difference between legal gross vehicle weight and equipment loadings.

(6) Legal gross vehicle weight, as per the California Vehicle Code, reflects the weight variance for the partial pack option selected by county:

	FA	RA	Total
22-foot full pack	4,180	11,500	15,680
Adjustment	+1,130	-2,290	-1,160
22-foot partial pack	5,310	9,210	14,520

Figure 19. Integrated chassis, body, payload, and dimensional characteristics.

Review of Bid Procedures. In an endeavor to evaluate and appraise the effectiveness of the proposed, but never applied, purchasing policies, the county requested and received permission to open and publish the contents of the two collection equipment bids rejected due to their late arrival. The related data from the three potential collection equipment suppliers were summarized and contrasted, including bid prices on the basic, optional items and modifications; the integrated weight distributions and payload tabulations; and the weight and dimensional data of bid items. An analysis of the comparative data and related proposals indicated that the developed bid procedures did generate significant differences among the specified decision-making criteria. These differences included:

- A range in total bid prices, excluding modifications and optional items, in excess of $21,000--an equivalent bid price difference of some 45 percent. The principal price variance was related to the specified understructure.

- The inability of the respective body manufacturers to mount their equipment on all the recommended chassis without major redesign or modification, if at all. The principal problems identified with mating their standard front loaders and the large sized chassis were:

  (1) The width of cab interfered with their standard loading arms and any modification would cause the unit to exceed legal width requirements (96 inches).

  (2) The front axle-to-back-of-cab dimension was too excessive to allow the standard front loading arms to be within legal height requirements during transit and still clear top of cab during lifting cycle.

  (3) The overall cab dimensions (height times width) prevented the cab from being tilted to the full forward position for service with the loading arms in the down position.

- An effective delivery time, inclusive of maximum specified delivery time of chassis and body manufacturers, ranging between 160 and 215 consecutive calendar days. The maximum delivery time of the body manufacturers varied between 50 and 90 consecutive calendar days.

- A variance in controlled payloads, that defined by established criteria and maximum truck chassis' weights per invitation, of nearly two tons. The range varied betwen 6-1/4 and 4-1/4 tons.

- A range in guaranteed weight variances between the recommended axle loadings defined by bidders' proposals and the final production weights of the equipment components--compaction body and understructure. The variances ranged from 3 to 5 percent of the estimated axle loadings, a potential payload decrease of 600 to 1,3-0 pounds. The variances reflected the bidders' experience or nonexperience with the particular chassis.

- Significant weight and dimensional differences for the 8-cubic-yard, 20-cubic-yard, and 40-cubic-yard containers and drop boxes. The variances occurred in the net usable lid opening and total weight of the 40-cubic-yard drop boxes, the net usable volume and total weight of the 20-cubic-yard drop boxes, and the net usable lid openings and total weight of the 8-cubic-yard containers. These differences reflect the bidders' design per the consultant's specifications and the requirements to insure compatibility with the manufacturers' collection components (i.e., understructure and front loader).

Certain inequalities and problems were brought to light during our attempt to develop a more rational purchasing policy, within the time and cost constraints afforded to the staff, for selecting and buying components for a waste collection vehicle. The considerations listed below hopefully may enable others to go beyond present efforts in developing a rational and effective purchasing policy to maximize payloads, as well as other operating needs:

(1) The difficulty suppliers encountered in obtaining accurate and consistent dimensions and weights from the chassis manufacturers for the collection equipment bids. Both the body manufacturers, as well as our staff, experienced great difficulty in verifying their so-called standard chassis dimensions. This problem was dramatically illustrated by one particular chassis manufacturer--not distributor--who reported and verified a critical dimension limiting the use of his equipment before the bids, and subsequent to the bid opening, reversed himself. It appears that the overall similarity of truck chassis, within their respective class, negate the need on the part of the chassis manufacturers to provide accurate dimensional data.

(2) The refusal on the part of the chassis manufacturers to obligate themselves to particular road-ready weights and delivery time when a penalty clause is built into the bid proposals. The fact that four of the seven chassis manufacturers failed to bid or to attach the required bid bond, evidenced this. In subsequent discussions with their representatives, we learned that the factory traditionally will not obligate itself to more than an effective range; the dealer can choose to take a risk and provide bids of specified maximums.

(3) The potential, and in this case actual, inequality of the bid procedures. Certain collection equipment manufacturers were disqualified, for example, when distributors of compatible truck chassis failed to submit bids. Although Dempster Brothers was disqualified due to their late bid, the staff would have been reluctantly forced to eliminate its bid because the Mack distributors arbitrarily withheld the MB 491S chassis--the only chassis compatible with the company's detachable front loader. The distributor bid the applicable

larger chassis in lieu of the MB 491S, a medium-sized chassis, due to its lower cost, although the staff had clearly requested that the firm bid both units, regardless of cost, to avoid this particular problem.

(4) The excessive and laborious efforts required on part of the collection equipment representatives in calculating theoretical payloads, equipment weight distribution, and legal vehicle and axle loadings for numerous applicable chassis.

(5) The difficulty in comparing and equating the integrated bids due to the respective bidders' different interpretation of the recommended procedures. The nature of the requests presented problems in arriving at comparable and equivalent definitions, particularly in the calculation of theoretical payloads.

(6) The need, on a practical basis, for interjecting a degree of subjective interpretation into the decision-making criteria in weighing the virtues of the alternative integrated collection units. Criteria based on theoretical payloads, delivery time, and costs, rather than a single price-oriented decision mode generate a give-and-take decision analysis. To eliminate the subjective nature of the ultimate decision would have required extensive procedures to develop appropriate weight factors for the respective criteria. Such procedures were beyond the scope of the project.

Although the staff was cognizant of certain drawbacks to the proposed approach, we felt its overall merits warranted implementation. We believe that, regardless of the above limitations, the county obtained an integrated vehicle more suited to the terrain and intended functions than one purchased on the basis of price alone. The advantages of the extensive investigations conducted to identify the chassis and collection equipment needs were manifested in terms of our ability to assure the county the purchase of equipment satisfying the minimum operating criteria, regardless of actual award recipient. This was accomplished by limiting the bids to those specified manufacturers capable of producing units within the developed and detailed specifications.

Container Sites

The development of construction drawings and specifications for the six containerized collection sites conforming to the general sanitation and usage requirements of the demonstration program and to the operating constraints imposed by the multipurpose collection vehicle involved: (1) an evaluation of the conceptual designs prepared in Phase I in light of the subsequent equipment investigations; (2) a compilation of the equipment constraints imposed by the respective manufacturers; (3) the preparation and refinement of alternative site designs compatible with the two different collection systems; (4) the selection of specific site development criteria (i.e., access road widths, wall construction, and paving requirements); (5) the development of final site designs and contract documents for the respective sites.

Original Concepts. Undertaking a comparative evaluation program dictated a site configuration that could be used in conjunction with both the drop box and front loading transfer systems. The original site layout considered at the beginning of the project was based on a modification of the container site designated as Type II (Figure 2). A collection vehicle with a right-angle attachment mounted on the chassis front bumper was to be used to service the 8-cubic-yard containers from the side rather than from the front. It consisted of a hydraulically operated sweep arm that engages a pulling bracket welded to the container. The base of the arm would engage a lug on the corner of the container and pull it through a 90-degree arc into alignment with the front loading arms. Once the container has been serviced and set back on the ground, the arm is re-engaged and the container is pushed back to its original position.

A review of the right-angle pickup attachment during subsequent field investigations, however, indicated that it was impractical for routine operation. The specific factors that led to this decision and the development of a site employing the standardized features of both systems (adequate maneuvering room parallel and perpendicular to the retaining wall) were:

(1) The apparent and recurring difficulties exhibited by the vehicle operator during the field demonstrations in maneuvering and aligning the sweep arm into proper position in relation to the brackets mounted on the container.

(2) The time-consuming nature of maneuvering the vehicle with respect to each container, rotating it through a 90-degree arc, backing off to lower the front loading arms, moving forward and loading the container, backing off to extract the arms, and moving forward and pivoting the container back into place.

(3) The loss of effective wall length due to the need to place the 8-cubic-yard containers at sufficient intervals to allow movement through a 90-degree arc.

(4) The abuse and wear and tear on both the containers and concrete platform.

Equipment and Testing Constraints. The constraints imposed by the testing program and the ability of the respective manufacturers to produce, using their standard designs, equipment capable of meeting the operational demands presented several unique problems. The design team attempted to balance equipment design and the usage of specialized attachments against container site design and construction costs. The three principal constraints were:

(1) The testing requirement that the site development criteria allow for the evaluation of both the 8- and the 40-cubic-yard bins at the same elevations with respect to user access (i.e., dumping level). This requirement interrelated the selection of wall heights, design of the bins, and servicing procedures. After due consideration, it was elected to utilize standard 40-cubic-yard drop boxes

(approximate overall height--96 inches) and construct bolted stilts on the 8-cubic-yard bins (approximate overall height--80 inches) to equalize their respective overall heights. The three equipment manufacturers reported that the increased elevation of the pick-up channels with respect to ground level neither affected their respective unit's rated lifted capacity nor offered any particular compatibility problems with their lifting arms. Their primary concern was insuring that the channels' relative position on the container wall remained unchanged.

(2) The need to develop two basic site configurations to ascertain user response to dumping their waste materials into the containers at ground level and at pick-up bed level. The development of four sites conforming to the basic design (container opening and dumping platform at the same relative elevations) and two sites conforming to the stipulated elevation difference (the dumping platform some 30 inches above the top of the containers) was achieved by designing and constructing two different retaining wall systems, one at 8 feet and the other at 5-1/2 feet. The alternative procedure of designing and constructing six identical wall systems at the 8-foot height and providing a 30-inch temporary platform for the containers at two sites, was discounted because of:

(a) The additional constructing costs.

(b) The suitability of terrain at two sites for the low wall configuration (5-1/2 foot height).

(c) The problems in maintaining the area around the platform.

(d) The fact that only one of the three potential equipment suppliers could service a large drop box at above grade elevations. The hydraulic understructure system offered by Dempster Brothers, Incorporated--the only noncable system on the market--has the flexibility to load and unload drop boxes (20- to 60-cubic-yards) at elevations as high as the unit's respective chassis. The two other manufacturers utilized the conventional cable system and were therefore limited to unloading elevations in close proximity to ground level due to the necessity of tilting their understructures to unload the drop box.

(3) The requirement that all containers utilized in the demonstration program, including the large drop boxes, be designed and built with a lid configuration system insuring, in so far as possible, the sealed storage of the waste materials at the container sites.

This last requirement generated the single most difficult design problem in terms of developing compatible site layouts, lid designs, and servicing procedures for the 40-cubic-yard system.

The selection of a lid system for the 40-cubic-yard drop box that permitted substantial usage of the containers' horizontal cross-sectional area, that could be safely opened and closed by the local residents, and that was compatible with the testing requirements, dictated a conventional side-hinged, counterbalanced, full-width lid system. Although a number of alternative lid systems were reviewed, including sliding lids mounted on runners and permanent lids built as an integral part of the container site, the lid system illustrated in Figure 20 proved to be the only alternative that was workable and economical and that maximized the available loading area. The lid system represented one of the primary differences between the two container systems and a key factor influencing the storage characteristics and local residents' acceptance of the respective systems.

The principal problem created by providing conventional side-hinged lids on the drop boxes, was that they restricted the use of the roll-off unit to one particular side--that side opposite the hinges. To achieve such a specific orientation of the box with respect to the dumping platform during successive replacements, without materially limiting site layouts and requiring excessive maneuvering of the containers, the drop boxes had to be designed and fabricated with two reversible lid configurations--a right and left opening lid assembly, respectively. This permits full usage of the two-stall concept and/or numerous options in servicing the one-stall site. The alternative procedure of utilizing one standard drop box (all right or left opening lid assemblies) proved to be cumbersome and would have necessitated (1) unloading the empty drop box in the stall occupied by the full container, thus effectively negating the value of the dual-stall design, and (2) limiting the site configuration at all six sites to facilitate service from a common direction. This latter item proved to be exceptionally difficult to comply with at a number of the site locations.

Although the selected lid design eliminated the need to maneuver the large containers in and out of position on a routine basis, provisions still had to be made for the probable operational occurrance when the wrong type of drop box (i.e., right or left loading) would be transported to the container site. In an endeavor to reduce these operational problems and minimize the space requirements to maneuver the large containers, the equipment manufacturers were queried about suggested modifications for their respective equipment. The two manufacturers of the cable-type understructure reported that with minimum modifications of the drop box runners, they could service the container from either end. This would permit them, in the above circumstances, to simply (1) unload the empty container; (2) remount it in reverse position; and (3) discharge it in normal manner in lieu of maneuvering a full or empty container. These modifications were included as an alternative on the collection equipment bid and were ultimately approved as part of the award package.

Alternative Designs. The alternative site designs examined in Phase I that could be serviced by the two collection systems were reviewed in order

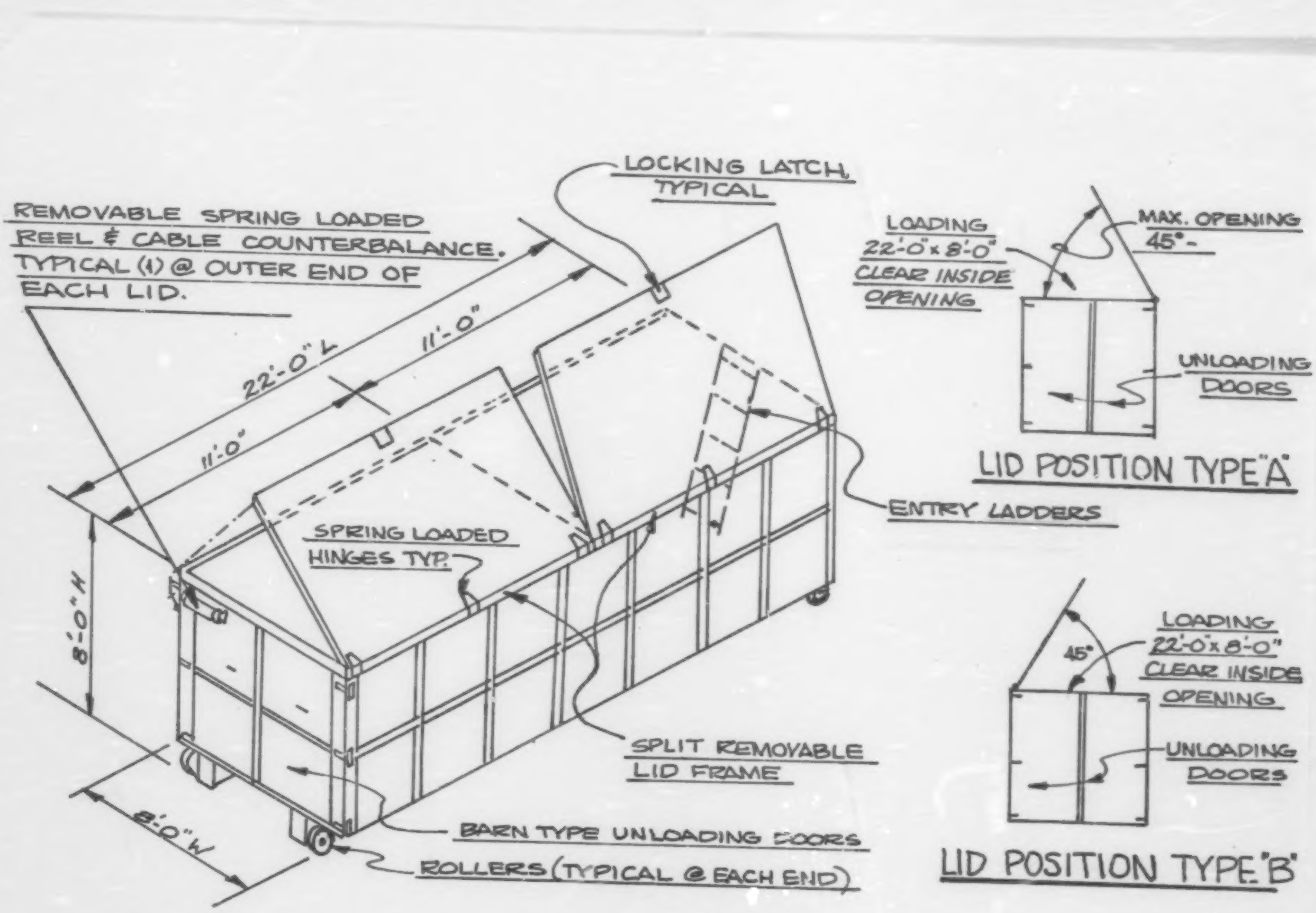

LOCKING LATCH, TYPICAL
REMOVABLE SPRING LOADED REEL & CABLE COUNTERBALANCE. TYPICAL (1) @ OUTER END OF EACH LID.
22'-0" L
11'-0"
11'-0"
8'-0" H
8'-0" W
SPRING LOADED HINGES TYP.
SPLIT REMOVABLE LID FRAME
BARN TYPE UNLOADING DOORS
ROLLERS (TYPICAL @ EACH END)
ENTRY LADDERS
LOADING 22'-0" x 8'-0" CLEAR INSIDE OPENING
MAX. OPENING 45° -
UNLOADING DOORS
LID POSITION TYPE "A"
45°
LOADING 22'-0" x 8'-0" CLEAR INSIDE OPENING
UNLOADING DOORS
LID POSITION TYPE "B"

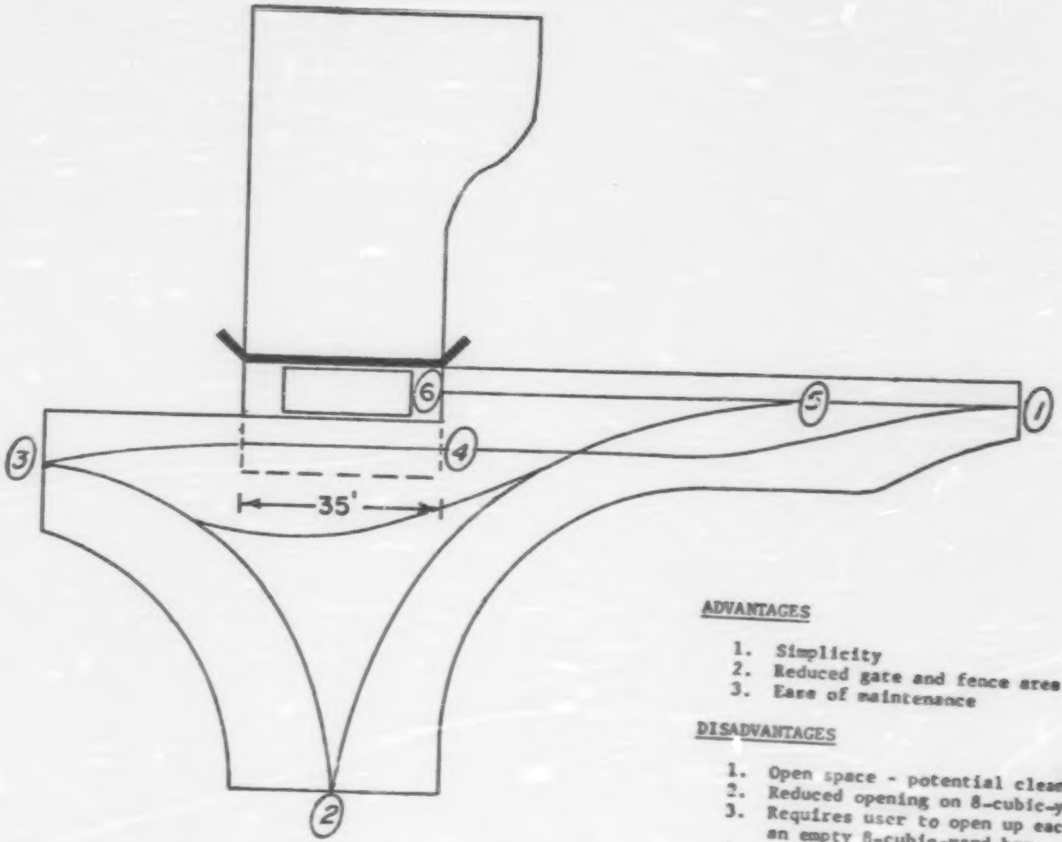
Figure 20. Container Types A and B – detachable body type 40-cubic-yard drop box.

to (1) choose a site layout that could handle both the front loading containerized system and also the on-and-off drop box system; (2) minimize the problems imposed by the equipment and testing constraints--namely the inherent difficulties of servicing a 40-cubic-yard drop box with lids; and (3) refine and select a particular configuration best fitting the geographical constraints of the test area. A number of alternative site layouts were reviewed including those employing the features developed in Phase I, the selected lid configuration discussed in the previous section, and other designs offering particular cost and/or operating advantages. The three site configurations best fitting the needs of the project and most compatible with the previously detailed constraints are graphically presented in the following illustrations (Figures 21 through 23; a fourth alternative utilizing a nonconventional lid system is illustrated in Figure 24. The figures include a summary of storage capacity (number of containers), physical characteristics (i.e., retaining wall length, fencing, paving and concrete slab areas, and vehicle access), and advantages and disadvantages. The first three site layouts (Types A, B, and C) employ the standard construction features previously detailed (i.e., wall height, paving, and auto maneuvering space), the selected lid configuration for the drop boxes, and the truck turn-around and maneuvering room required to service the 8-cubic-yard containers in a conventional manner (i.e., head-on). Their respective configurations are based on the access and maneuvering requirements imposed by the alternative servicing procedures. The principal differences among the three container sites include:

- Flexibility in locating the sites on specific parcels with respect to vehicle and truck access. Types B and C can be designed to facilitate access from either side; Type A requires orientation of the dumping platform in a specific direction if its principal advantage over the three directional sites is to be maintained. To orient the containers for the users ease will require that all six single stall sites be designed and constructed to permit service from one common direction.

- The need for a left and right opening lid assembly on the 40-cubic-yard drop boxes. The three directional sites (Types B and C) inherently dictate this requirement if they are to be put to effective use.

- Operational requirements to service the drop boxes. Type B (the two stall concept) eliminates all requirements for maneuvering the drop boxes; the collection vehicle unloads the empty into one stall and collects the full from the other. Type A (the single stall concept) generates significant servicing problems in dragging and pushing the full drop-box out of position and away from the wall to permit unloading the empty drop-box into the only available space. Type C (effective capacity 1-1/2 stalls) offers a compromise between these extremes; it reduces the maneuvering requirements to simply dragging the full container approximately 15 feet to enable the collection vehicle to unload the empty from the other direction.



CAPACITY

One - 40-cubic-yard box
Five - 8-cubic-yard boxes

CHARACTERISTICS

1. Retaining wall - 35 linear feet
2. Fencing:
   Walls - 795 square feet
   Gates - 450 square feet
3. Paving:
   Truck - 5,315 square feet
   Auto - 4,640 square feet
4. Concrete slab:
   700 square feet
5. Earthwork:
   Dependent on site
6. Vehicle access:
   Auto - dependent on site
   Truck - one direction only

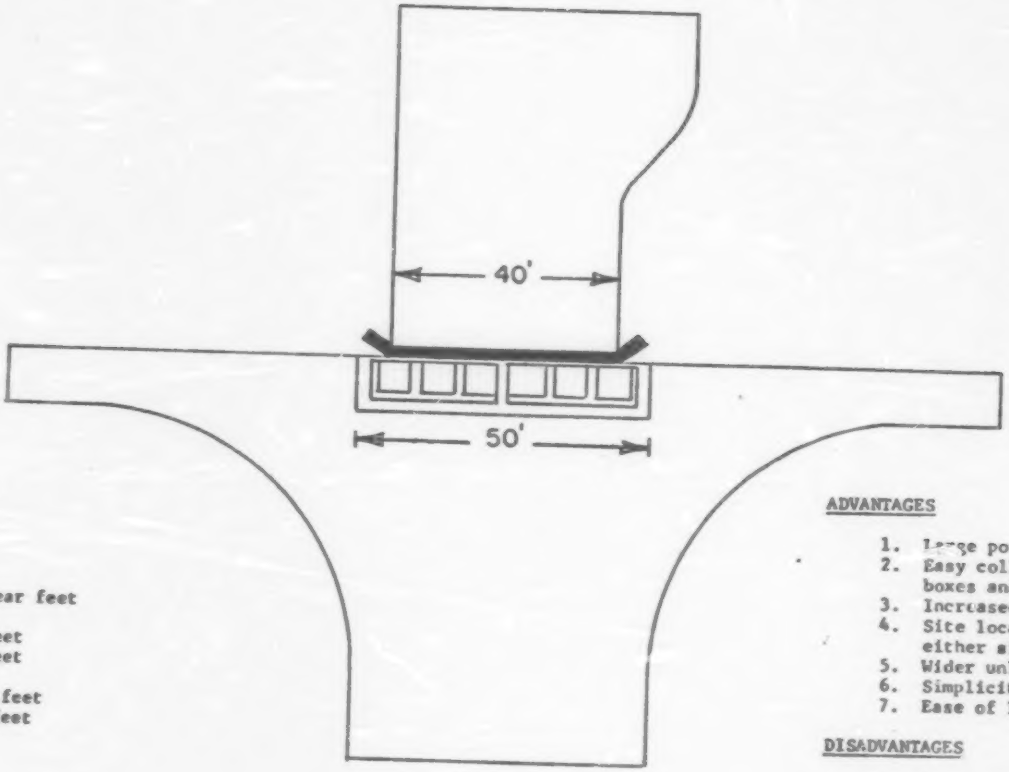
ADVANTAGES

1. Simplicity
2. Reduced gate and fence area
3. Ease of maintenance

DISADVANTAGES

1. Open space - potential clean-up problem
2. Reduced opening on 8-cubic-yard boxes
3. Requires user to open up each lid until he finds an empty 8-cubic-yard box
4. Maneuvering 40-cubic-yard box — potential accidents and damage to site
5. Less flexibility in locating container site on parcel of land
6. Greater truck loading time (40-cubic-yard box)
7. Must latch each 8-cubic-yard box before loading
8. Rigid frame to support fence enclosure

Figure 21. Type A, two directional, one stall capacity. (Circled numbers on sketch refer to transfer sequence and are explained in Appendix E, Transfer Sequence.)



CAPACITY

Two - 40-cubic-yard boxes
Six - 8-cubic-yard boxes

CHARACTERISTICS

1. Retaining wall - 40 linear feet
2. Fencing:
    Walls - 847 square feet
    Gates - 640 square feet
3. Paving :
    Truck - 5,120 square feet
    Auto - 2,940 square feet
4. Concrete slab:
    450 square feet
5. Earthwork:
    Dependent on site
6. Vehicle access:
    Auto - dependent on site
    Truck - either direction

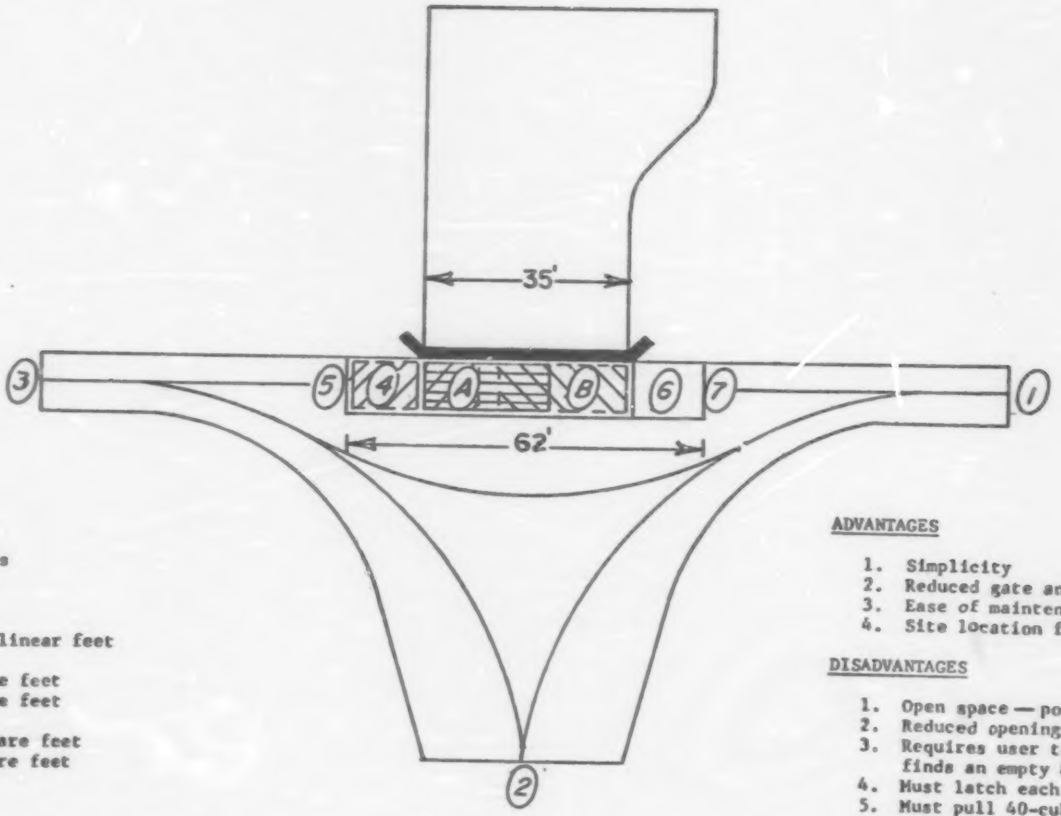
ADVANTAGES

1. Large potential reserve capacity
2. Easy collection procedures for 8-cubic-yard boxes and 40-cubic-yard boxes
3. Increased capacity of 8-cubic-yard system
4. Site location flexibility — access from either side
5. Wider unloading area — auto
6. Simplicity
7. Ease of lid maintenance

DISADVANTAGES

1. Open space - potential clean-up problem
2. Reduced openings on 8-cubic-yard boxes
3. Requires user to open up each lid until he finds an empty 8-cubic-yard box
4. Must latch each 8-cubic-yard box before loading
5. Requires two types of 40-cubic-yard drop boxes - left and right

Figure 22. Type B, three directional, two stall capacity. (Circled numbers on sketch refer to transfer sequence and are explained in Appendix E, Transfer Sequence.)



CAPACITY

One - 40-cubic-yard box
Five - 8-cubic-yard boxes

CHARACTERISTICS

1. Retaining wall - 35 linear feet
2. Fencing:
   Walls - 695 square feet
   Gates - 550 square feet
3. Paving:
   Truck - 4,800 square feet
   Auto - 2,640 square feet
4. Concrete slab:
   620 square feet
5. Earthwork:
   Dependent on site
6. Vehicle access:
   Auto - dependent on site
   Truck - either direction

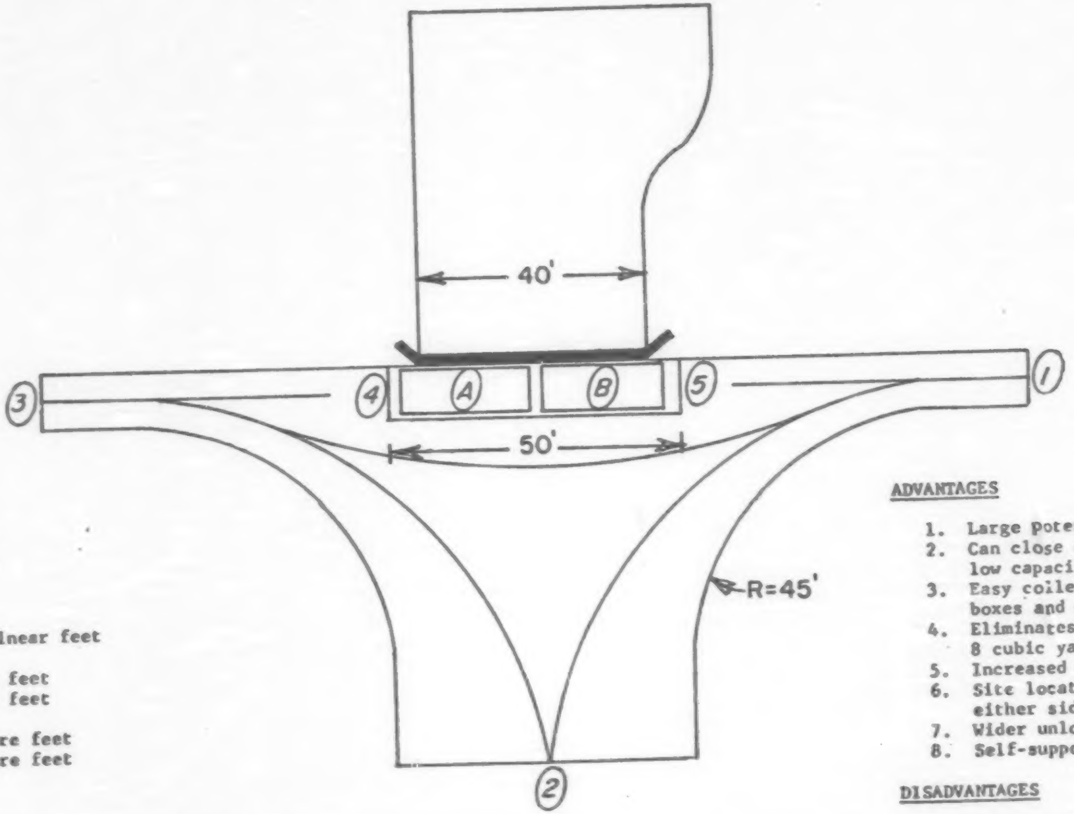
ADVANTAGES

1. Simplicity
2. Reduced gate and fence area
3. Ease of maintenance
4. Site location flexibility — access from either side

DISADVANTAGES

1. Open space — potential clean-up problems
2. Reduced openings on 8-cubic-yard boxes
3. Requires user to open up each lid until he finds an empty 8-cubic-yard box
4. Must latch each 8-cubic-yard box before loading
5. Must pull 40-cubic-yard drop box back 15 feet
6. Requires two types of 40-cubic-yard drop boxes - left and right
7. Rigid frame to support fence enclosure

Figure 23. Type C, three directional, one and one-half stall capacity. (Circled numbers on sketch refer to transfer sequence and are explained in Appendix E, Transfer Sequence.)



CAPACITY

Two - 40-cubic-yard boxes
Six - 8-cubic-yard boxes

CHARACTERISTICS

1. Retaining wall - 40 linear feet
2. Fencing:
    Walls - 847 square feet
    Gates - 640 square feet
3. Paving:
    Truck - 5,120 square feet
    Auto - 2,940 square feet
4. Concrete slab:
    480 square feet
5. Earthwork:
    Dependent on site
6. Vehicle access:
    Auto - dependent on site
    Truck - either direction

ADVANTAGES

1. Large potential reserve capacity
2. Can close off 1/2 of dumping platform for low capacity sites
3. Easy collection procedures for 8-cubic-yard boxes and 40-cubic-yard boxes
4. Eliminates all lids on containers — both 8 cubic yard boxes and 40-cubic-yard boxes
5. Increased capacity of 8-cubic-yard system
6. Site location flexibility — access from either side
7. Wider unloading area — auto
8. Self-supporting fence enclosure

DISADVANTAGES

1. No natural backstop - potential clean-up problem
2. Complicated lid design - not standard
3. Dependent on fixed lid system - difficult to repair

Figure 24. Type D, three directional, two stall capacity (lids at site). (Circled numbers on sketch refer to transfer sequence and are explained in Appendix E, Transfer Sequence.)

- The effective container dumping area and maximum storage capacity available to the users. Of the three alternatives, the two stall concept (Type B) provides the greatest available unloading area (40 feet of container width) and maximum storage capacity (80-cubic-yards); Type A provides 20 feet and 40-cubic-yards; Type C, 35 feet and 70 "effective" cubic yards. The apparent construction costs. The construction costs of the alternative site layouts depend on earthwork, paving, drainage, access, and wall length. A review of the physical characteristics summarized in the Figures 21 through 23, points up the cost advantage, although not significant, of the Type C layout.

The fourth site layout presented (Type D) was considered in addition to the three conventional site plans, due to its attractiveness in eliminating all the operation problems and servicing requirements associated with containers utilizing the counterbalanced lid assemblies. The two stall, three directional site employs a special lid assembly permanently fixed to the fence enclosure at the site. The design (1) eliminates the operational problems associated with the drop boxes in terms of specific orientation; (2) provides full effective opening of the 8-cubic-yard containers rather than the reduced area of the standard inner lid concept (a lid with a lid design); and (3) affords the residents equal ease in utilizing either storage system. Potential problems include developing a special lid assembly (nonstandard), including support structure to ensure proper covering of the containers.

In reviewing the alternative site layouts with respect to the above features, including apparent costs, flexibility, and operational procedures, the testing requirements, and the available land parcels, the design team selected Type "C" as the basic plan layout for the six containerized collection facilities. The reasons for this selection included:

(1) The difficulty in locating all six sites on the given land parcels to permit servicing the drop boxes from a common direction, thus negating the principal advantage of the single stall concept.

(2) The incompatibility of the available land parcels and the excessive access road lengths required for Type A to permit sufficient distance to maneuver and replace the drop box. The 50-foot effective overall length of the unit (collection vehicle and drop box) dictated a minimum 100-foot approach road.

(3) The excessive maneuvering procedures dictated by the single stall concept; trial runs performed on similar equipment involved excessive replacement time and cumbersome servicing procedures.

(4) The additional construction expense of providing two stalls (Type B) with apparently little, if any, improvement in storage capacity, effective dumping platform, and operational problems linked to a two container layout; there was some, although not significant, reduction in the servicing procedures.

(5) The nonstandard nature and apparent costs of designing, installing, and maintaining a fixed lid system attached to the container sites.

(6) The incompatibility of the fixed lid system with the basic test requirements of the demonstration program in terms of preventing differentiation of the residents' usage of two container storage systems. The fixed lid system tends to equalize the lid usage, effective container openings, and respective storage properties of the two container systems.

Site Development Criteria. To facilitate the design process and insure the development of a common set of physical characteristics at six widely varying geographical settings, the following site development criteria was established and approved by the county. The criteria reflect the local terrain, geological and rainfall constraints, and the county's historical experience in maintaining roads and structures in the remote test areas; they are not intended to universally apply to other areas.

Typical Site Layout - Type C

A three directional, 35-foot dumping width, dual elevation container site employing adequate maneuvering room to conventionally service both storage systems.

Access Roads - Width

Public: Minimum 12-foot paved surface with 2-foot unpaved shoulders for all sites.
Truck: As dictated by the particular access and maneuvering requirements.

Paved Areas - Grades

Public: 10 to 12 percent maximum on access roads; 2 percent maximum in parking and unloading areas with drainage away from face of wall; and 5 to 8 percent in turn around area.
Truck: 8 to 10 percent maximum on access roads; 2 percent maximum in and around container area; and 2 to 6 percent in truck turn around area.

Paving - Asphaltic Concrete

Minimum design based on Traffic Index of 5 and appropriate R Values derived in field; alternate structural sections (AC, base and subbase) or deep lift (AC) construction permissible, differentiated between design requirements for truck and auto areas.

Structural Walls

Design: Height--four sites at 96 inches and two sites at 66 inches excluding 6-inch curb; length--36 feet at maximum permissible height.

Alternative Wall Types: Concrete crib wall with reinforced concrete cap acting as container rub rail and dumping curb; concrete reinforced block wall; or standard poured in-place reinforced concrete wall.

Drainage

Provide drainage facilities at toe of all slopes adjacent to pavement (lined ditches), at collection points of paved areas to carry into natural water flows (lined channels), at sites where run-off would drain into site (swales) and where particular springs or subsurface flows are encountered (interceptor drains).

Footings

Permissible soil bearing values based on 2,500 to 3,000 pounds per square foot subject to field reviews.

Minimum Turning Radii

Public: 20 feet to inside axle.
Truck: 40 feet to inside axle.

Fire Clearances

Thirty feet minimum fire clearance of flammable material from periphery of containers per California Assembly Bill No. 358 (initiated as a by-product of feasibility study).

Appurtenances

Curbs (AC): Auto and truck areas where moderate downhill slopes encountered.
Truck Barrier: Truck maneuvering area where substantial downhill slopes encountered.

Future Improvements

To be evaluated during basic test program.
Dumping Brace: Installed in wall sleeve; suggested to ease task of householders in dumping large garbage cans.
Fence Enclosure: To contain wind-blown articles and ease general housekeeping function.
Wheel Stops: To prevent unloading vehicles from backing into containers, located at 30 inches from face of wall.
Guide Rails: Suggested to control spacing and aid unloading procedures for drop boxes, necessity to be evaluated during test program.
Lapping Device: Suggested to prevent waste material from being deposited between face of wall and container.

Design Process. We have briefly delineated the process utilized to arrive at the final site designs. Although the design process per se, warrants little amplification due to its standard nature and agreement with generally accepted engineering principles, this topic is included to (1) provide a further demonstration of the consultant-county work approach; (2) develop a historical record of the procedures utilized; and (3) acquaint other agencies or persons with the design process used. The steps that were employed in designing the container sites included:

- Developing preliminary topographic maps and cross sections of the six proposed container sites by the county survey crews. These maps generally depicted the adjacent county roads, right-of-ways, proposed property lines, existing drainage systems, outstanding physical characteristics (i.e., structures, natural water flows, and substantial trees) and respective contour lines. The maps were at a minimum horizontal scale of 1 inch equals 20 feet and at 5-foot contour intervals.

- Overlaying the preliminary topographic maps with the generally accepted site layout to ascertain the optimum site location and additional surveying requirements. The selection of a particular site configuration was based on balancing the cut and cover requirements, minimizing clearing operations and access road lengths, and facilitating acceptable access for the local populace. In addition to the maps, the engineer had the benefit of the county's field survey notes, photographs, and personal field experience in selecting the optimum site locations.

- A field review of the engineer's initial overlays on a site-by-site basis with regard to recommended access provisions, elevations and wall type, and overall site compatibility. The county detailed suggested modifications based on property acquisition problems, compatibility with adjacent private property, general county planning provisions, and familiarization with local conditions. The respective topographic maps were updated and improved to reflect the required survey data needed for preliminary site designs.

- Developing preliminary site designs detailing wall location, access road grades and location, definitive auto and truck maneuvering areas, drainage patterns, cut and fill areas, net import or surplus earth volumes, and required appurtenances. These designs were based on the previously cited criteria and the county's approval of the preliminary layouts.

- An in-depth review of the preliminary site designs by the county's engineering staff, to assure concurrence with recommended designs before the preparation of the final drawings and associated technical effort.

- Preparing the final drawings and contract documents for the sites.

A key point in the series of steps is the constant degree of communication and interplay that existed between the engineer and the county. This enabled the county to accelerate the project by initiating preliminary site designs on parcels whose purchase agreements with the respective owners were not yet completed.

Contract Documents. The State of California's "Standard Specifications" as annually published by the State Department of Public Works, is used by the county Public Works Department in developing Standard Provisions for all highway-related projects within the county. Standard Provisions include (1) direct reference to sections within the standard specifications; (2) construction details; (3) contract bid items; and (4) the proposal and agreement forms.

The construction requirements for the container sites are covered within the Standard Specifications which were used for the basis of the contract documents.

Bid Procedures. The remoteness of the six container sites led the staff to conclude that:

(1) The construction of the sites should be advertised in two separate contracts with three sites each.

(2) Alternatives for certain items should be considered.

(3) Advertising for a lump sum bid would decrease possible overruns in quantities and added material costs.

The division of the construction into two separate contracts was planned for advertisement in early spring. The intention was to allow the smaller Class A contractors to compete with larger contractors. Also, early advertisement dates in the past, have resulted in lower bids.

The optional alternatives for certain construction items was included so that the various bidders could determine the most economical type of construction for their particular firm. They included:

Wall Types	(1)	Concrete crib
	(2)	Concrete block
	(3)	Cast in-place concrete
Pavement Types	(1)	Aggregate base and asphalt pavement
	(2)	Deep lift asphalt pavement

Another reason behind a lump sum bid was that the inspection time by county personnel would be reduced significantly.

Because of delays in property acquisition, the proposed advertisement date was rescheduled to July 1. The staff assumed that by this date the various contractors would already be involved in other construction projects and the small contractors would not actively bid. Therefore, a third bid alternative to include all six sites together was added to stimulate bidding from larger contractors.

The budgeted amount for the total (six site) project was $115,580. The engineer's estimate was $105,907, based on unit prices from recent projects within the county and including increases to compensate for the remoteness of each site. The bid result for the six site project was:

Low Bid	$207,295.00
Budgeted amount	$115,580.00
Amount over budgeted allocation	$ 91,715.00

The bids were rejected after discussion with the engineering staff, the Environmental Protection Agency, and local contractors.

The reasons given for the high bid results were:

(1) Time of year - Contractors involved in other construction and did not have supervising personnel available.

(2) Remoteness of sites - Unanticipated construction costs to contractor.

(3) Site concepts - Requirements of the 8- and 40-cubic-yard systems limited design changes that could be applied toward a lower bid price.

The county, with the concurrence of the Environmental Protection Agency and considering the schedule to implement the project during the 1971 calendar year, readvertised the project. The revised estimate for the six site project was as follows:

Five Sites	$101,051.32
Thorn	$ 22,000.00
Total (Six sites)	$123,051.32

Contract Award. The bids for the five sites were opened on July 21, 1971, and bids for the Thorn site were opened on August 25, 1971.

Although the contract award dates were in the fall of the year, it was anticipated that the construction could be completed before inclement weather. Early storms, however, necessitated a winter shutdown and construction was rescheduled for the spring of 1972.

Central Landfill

General. The determining factors in the choice of a site were primarily: (1) availability of 40 acres of relatively level, stable land; (2) accessibility from main roads; (3) location approximately equidistant from container sites; (4) out of view from major roads and populated areas; and (5) potential use of landfill as a recreational area. The site chosen is an abandoned lumber mill site and fits well within these criteria.

Advantages of Site. From a community standpoint, the site's isolation is ideal. No residences, facilities, or activities are in a position to observe the operation except for one house which views an unused corner of the site. In compliance with State requirements a geologic analysis was made of the site. The topography is relatively level and the soil is easily excavated to a depth of 10 to 15 feet. The excavations will provide reasonably granular material for road construction and sufficient clay material for final cover. The tributary area for surface waters is small and the underlying rock strata apparently contain no aquifers. Water is available (on site or from the river), however, to replenish the fire fighting and dust control supply. Buildings on the site, with minor rehabilitation, will serve for storage and maintenance of vehicles, office, and caretaker's quarters.

Restraints on Site. Access to the site is on a one lane unimproved road from the freeway turnoff at Benbow. County Public Works Department will perform minor repairs and maintenance on access road. The eroding bluff along the Eel River necessitates setting the proposed landfill back 200 feet in order not to risk the danger of further undercutting and erosion. Surface drainage generally flows to the intermittent waterway coursing through the middle of the site which in turn discharges over the bluff into the river. Subsurface seepage is "perched" on the underlying bedrock and will be intercepted and diverted away from the trench area to prevent contamination. Considerable debris and a number of minor structures remain on site from previous mill operations and will have to be razed and placed in the landfill. Some clearing of trees and brush will be necessary to meet State code requirements for disposal site firebreaks.

Development of Landfill. Setbacks from the property line are required on every side for bluff clearance, visibility screening, access roads, and preservation of maintenance buildings. The resultant landfill, however, conservatively provides for 20 years of operation and subsequent developments may extend this life expectancy considerably.

The landfill development is planned for three phases of construction and operation. Each phase commences with a trench excavated into the bedrock approximately at right angles to, and sloping toward, the existing central drainageway. Trenching provides: (1) material which can be stockpiled for final cover and other use; (2) the starting point for the progressive excavation of each phase; and (3) an interceptor and collector system for subsurface seepage and potential leachates. For the seepage collector system, the existing drainageway becomes an asset in that it forms a natural trunk collector at the bedrock level.

Phased development offers the advantage of keeping options open for adjustment of surface and seepage water controls, for revision of landfilling procedures, and for relocation of fill construction operations to optimize site utilization. The master plan will be reviewed and revised by the county at appropriate intervals to accommodate changes dictated by observations and evaluations made during site development. The master plan provides an on-site road net which minimizes relocation. All weather access roads to the working face will be built to the minimum standards that will suffice for their short-term use, based on Department of Public Works local experience. Operations will not require compactor vehicles to leave these roads for dumping during wet weather.

Berm and road construction will divert surface waters from initial operations, but in all probability the existing central surface drainageway will have to be relocated.

Field Surveys

To identify and define those human variables and physical constraints that would ultimately determine the success or failure of the rural area containerized collection system, on-site field surveys and interviews were conducted at six dump sites adjacent to, or in the vicinity of, the proposed container sites. The impetus for these investigations was to develop a clear picture of the actual dumping habits and attitudes of the areas' rural citizenry so that these factors could be incorporated into the basic design of the system. The specific objectives included measuring or documenting:

(1) Site Environment - dump site appearance in terms of litter, blowing paper, odors, and vectors; general roadside conditions along access highways; and compatibility with adjacent land use.

(2) Public Usage - daily and weekly traffic counts, type and estimated volume of solid wastes, prevalent containers, vehicle type and ownership distribution, age and sex distribution of vehicle driver and passengers, average stay, and unloading procedures.

(3) Public Acceptance of Dump - complaints about dumps, concern or nonconcern about existing conditions, social relationship between dump and surrounding community, average travel time and/or distance, number of visits per month, and general views of existing system.

(4) Public Reaction to Containerization - general reaction to altering system, concern over bulky items, willingness to incur or recognize additional costs and/or taxes, basic attitudes on containers, and reaction to site relocation.

Scope of Activities. The scope of activities included on-site public usage studies and interviews with cooperative users at each of the sites, development of a photographic record of the prevailing conditions at the dumps, and vehicle monitoring before and after the field surveys. The investigations were limited to the test area (Planning Area I) with emphasis on the rural area dump sites at Alderpoint, Blocksburg, Fruitland, Petrolia-Honeydew, and Thorn. The central dump site at Garberville was surveyed to define the volume of traffic to be serviced by the proposed Garberville central landfill site. The survey forms were designed to permit correlating the users' attitudes with the interviewers' observations of their actual dumping habits.

The surveys were conducted during the three-day period beginning on Friday, April 2, 1972, from approximately 10:00 a.m., to 4:00 p.m., by eight Humboldt State College students supplied through the Center for Community Development, a nonprofit organization providing a liaison function between the college and the general population. The Center evaluated the forms before the surveys were actually initiated; their expertise in conducting similar type investigations proved invaluable in easing the students' difficult task. The students were selected on the basis of their familiarity with the region, their ability to provide their own transportation to and from the sites, and their experience in conducting surveys and field interviews.

Before the field surveys were initiated the students were briefed on the nature of the project and its objectives, thoroughly familiarized with the questionnnaires and survey forms, and given maps and driving instructions. They were specifically instructed to record the views and opinions in the language of those interviewed to provide a meaningful appraisal of the local residents' concern or interest. The teams were monitored in the field by the county and consultant personnel, and the data derived from the first day of the survey were reviewed personally with each interviewer. Finally, the students were asked to prepare a summary of their experience, detailing their opinions and recommendations on such factors as:

- Apparent user attitudes
- Key hurdles to overcome in implementing the new system and obtaining community cooperation
- Reaction to containerization
- Appropriate community education, and communication media approaches
- Observed local peculiarities and their possible effect on container system

- Criticism and/or recommendations for future surveys.

Overview. Although the actual traffic counts for the three-day survey were low in relation to the previously metered usage patterns, the results of the field surveys were gratifying in terms of developing insight into the rural citizens' attitudes, concerns, and acceptance of the existing dump environment; defining their personal dumping habits; and appraising their reaction to the proposed containerized waste collection system. The utilization of students rather than county employees was apparently a major factor in permitting the local populace to express their frank, and sometimes "blunt", opinions and comments. There were a few cases where the students encountered outright hostility and suspicion; these instances coupled with the rural nature of the sites, confirmed the need for a minimum of two interviewers per site. Generally, once the individual users were informed of the nature and purpose of the surveys, they were friendly, cooperative, and readily answered most of the questions put to them. The only consistent negative comments expressed by the respondents centered around the cost and questionable need of the survey itself.

The significance of the studies and relevancy of the subjective information derived from the 3-day survey can best be conveyed in the students own words. The following summary was prepared by the student team surveying the Alderpoint site and illustrates the nature and usefulness of the feedback; it was the most comprehensive and detailed report.

STUDENT IMPRESSIONS (Alderpoint Dump Site)

> "The Present Dump. The Alderpoint Dump serves not only as a disposal site for the public's garbage, but also as a social gathering place for people of all ages. The younger kids seem to enjoy driving back and forth over the narrow suspension bridge, and the dump makes a convenient turning-around place. They also like to gather there to talk, drink beer, and shoot crows and squirrels--that seems to be good sport in that town. Some of the older people seem to like these activities too; but quite often it seems that while one person is dumping, a friend will pass on the roadway and stop to talk for a while. The dump's location makes this social gathering place possible; it's just slightly out of town and there's a big wide spot in the road where several cars can pull over at one time.
>
> "Many of the townspeople had complaints about the dump. The most recurrent gripes were that the dump was an unavoidable eyesore and that because most of the trash ended up in the creek, just a quarter mile from its merging with the Eel River, the water pollution in this trout and steelhead spawning ground was inexcusable. Another frequent complaint was the blowing paper that littered the highway a quarter to half mile in either direction. They

pointed out that the county doesn't burn it off as often as they should or promise to. Apparently on several occasions, the County Department of Public Works has not kept an appointment with the California Division of Forestry to burn the dump. A lot of people mentioned the noxious smell of the dumping area, which by Sunday was becoming sickening within fifty feet of the pit. One gentleman was very concerned about the health hazard of this dump and all dumps of this nature; he was interviewed Sunday, after a new batch of flies had hatched and the yellowjackets had become thicker.

"There were people in the town of Alderpoint that had no complaints about the present dump. A frequent comment was 'this has always been the dump.' Most of these people had lived in Alderpoint the greater portion of their lives or for at least twenty years. Some of them seemed mainly concerned about the cost of a new system, while others seemed genuinely pleased with the condition of the dump. It is possible that a correlation might be drawn between this latter group's contentment with the dump and their own way of life; it seemed that most of the people who thought the dump not unclean or unsightly were rather unkempt in their own appearance and in the appearance of their vehicles; furthermore, they generally had their refuse packaged sloppily or not at all and they usually did not get their garbage all the way into the pit. It would be unfair to stereotype these people into lifestyles, but there did seem to be a pattern that might be valid: if people live in and accept haphazard conditions in their own home, such conditions elsewhere are unapt to bother them. The people in this group were also very unwilling to pay for the cost of a new system.

"The New Location. To begin with, most of the people in town were aware of the fact that a new site was being considered closer to, or in, town. Many of them knew the exact location of the new site. Some of these people were all for the new site on Steelhead Road; some didn't care where the new site was (or if the dump remained in the same place) as long as the conditions were improved to eliminate the blowing paper, water pollution, etc. Some people definitely wanted the dump to remain in the same place, even though they were for the replacement of the open dump with a container site. Their points were many and valid. That site 'has always been the dump.' The people are used to dumping there, and they might continue doing so, even after the new site is developed (especially if there is an on-site charge for the containerization method). These people could not see going to the expense of purchasing a new piece of property, either. And some of them said that the government (the Department of Public Works) was going to do what they wanted to anyway, and why was tax money even being spent for this survey? That was a hard one, because neither of us had a good reason to give them. We admitted this to them and they respected us for it. That was one thing that was very evident during the entire weekend--once the people got to talking to us, there was an openness, a two-way communication with little or no hostility on either side. I think the fact that we were students rather than employees of the Department of Public Works helped to facilitate this communication: the townspeople were not afraid of us as soon as they found out our purpose, and we were not afraid of our jobs. This encouraged a frankness and honesty not often present in such interview situations.

"Our Opinions and Recommendations. It didn't take us long to formulate our opinions on the present dumping system. It's bad. Although we could understand why some people found nothing wrong with it, we couldn't agree with them--the dump is definitely an eyesore and a pollutor. It is a fire hazard and if it were burned more frequently, the hazard would probably be cut quite a bit. The flies, yellowjackets, and smell becomes worse as the temperature rises, compounding the effects of nausea.

"If it is inevitable that the container site will be on Steelhead Road, then it will be necessary to begin cleaning up the present site immediately upon the installment of the container site. If it is let go, the people will continue dumping in the old site, where they have always dumped. Besides, the reason for the container site is to improve conditions; leaving the old site to rot while contracts and appropriations are being hassled would not be a very good show of faith. And chances are that no matter what happens, the old site will continue to be a social gathering place for many years to come, which could also prolong its role as a place to throw one's garbage if that image isn't completely removed.

"Aside from all this, we can see no reason why the present dump would not be an excellent location for the container site. For all the social reasons given above, it seems the most logical place. Very few modifications would have to be made to install the containers. A slight amount of excavating would be necessary to make it possible for the trucks to pick up the containers; 40-yard receptacles are recommended for this site because of the amount of garbage and the fact that a few citizens were concerned about the containers not being able to accommodate the larger refuse such as tree trimmings, lumber, etc. A curb or retaining wall could be installed for the convenience of the people dumping (many are reluctant to get too near the edge, which is understandable with the present construction). A wire cage would be good to contain the paper that might otherwise blow out of the area. The older pit on the eastern bank of the present dump could be used initially; this way, the present dump could be cleaned up simultaneously with the operation of the new container method (also immediately upon the installment of the container). When the present site is completely clean, then the container could be switched to there, so the eastern bank could be cleaned in a like manner. We feel that the modifications of the present dump would cost the taxpayers of Alderpoint less money than the Steelhead Road site, and would please them in other ways as well.

"Regarding the form of payment for the new container method, we have mixed feelings (as do the townspeople). In some ways an on-site fee seems more fair; the people making the most use of the dump put out the most toward its maintenance. However, such a fee might discourage some people from using the dump and their garbage would end up elsewhere, defeating the purpose of the new system. Whereas almost everyone complains about rising taxes, most people pay them. So perhaps the surest way of getting it paid for and getting people to use the dump is to tax them more. However, as a couple of men brought up, it seems that with all the propery, income, and sales tax already that some waste could be eliminated somewhere and there would be no need for further taxes."

Field Conditions. The following narrative and photographs describe the specific terrain and prevailing operation and appearance of the individual sites.

Alderpoint Dump Site--The Alderpoint site is situated on a steep slope terminating in the Carter Creek, within 1/4 mile of its merging with the Eel River and a major spawning ground for trout and steelhead (the Steelhead Fish Hatchery is some 3 miles up the Eel River). The vehicle unloading area is located on a bluff, approximately 150 feet above the creek, adjacent to the Alderpoint Road, and less than a mile from the community of Alderpoint. The site is an unavoidable eyesore to passing motorists and precipitates indiscriminate dumping and general littering along a 6-mile-length of the Alderpoint Road.

The county maintains the site on a limited basis--intermittently burning off or clearing the bluff--due to the steepness of the dump face. The resultant appearance is a classic uncontrolled dump with odors prevalent within 50 feet of the dump face, rodents, larvae, and animals (western gray squirrels, yellowjackets, dogs, crows, red-tailed hawks, and vultures). (Figures 25 and 26.)

Blocksburg Dump Site--The Blocksburg site, like the Alderpoint site, is located off the Alderpoint Road on a bluff overlooking a creek, the Dobbyn Canley Creek, some 12 miles north of Alderpoint. The community of Blocksburg is approximately 1 mile north of the site. Unlike the Alderpoint site, the dumping area (a semirestricted pit) is situated on relatively flat terrain, permitting the employment of standard dump maintenance policies (intermittent controlled burning and covering of waste) and containment of the bulk of the wastes to the confines of the pit. The generally unsatisfactory appearance of the site in terms of litter and windblown waste is principally attributed to the prevailing wind condition; the basic nature of individuals in this area is reflected in the lack of roadside litter along Alderpoint Road. Again, the dump harbors flies and yellowjackets, animals, and numerous birds.

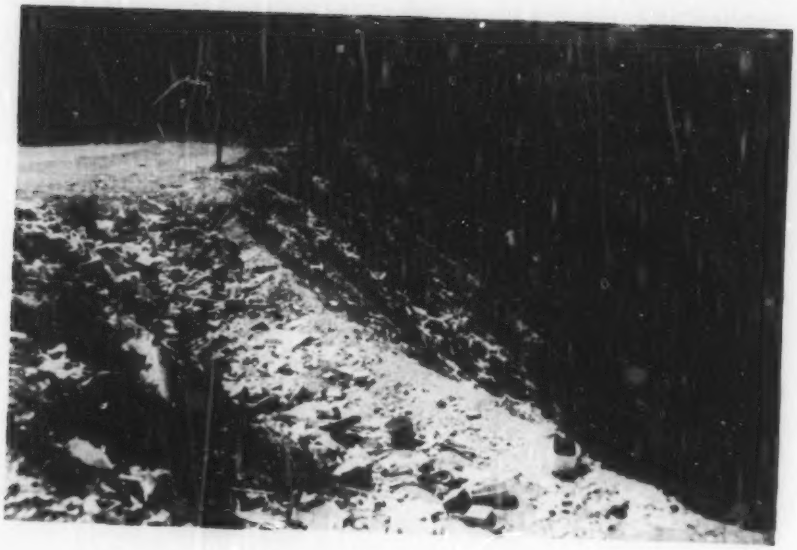


Figure 25. Alderpoint dump.

Reproduced from best available copy.

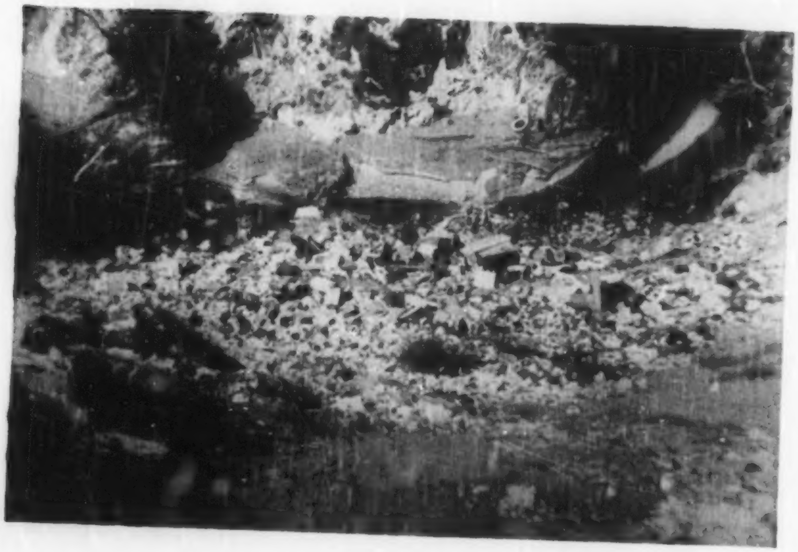


Figure 26. Alderpoint dump.

Fruitland Dump Site--The Fruitland site services a geographical area, rather than a distinct community; it is within 15 minutes of the more densely populated regions strung out along Highway 101 (the major coastal freeway). The site is located in a heavily wooded area approximately 1/2 mile off the county road via a private dirt road. The trench is adjacent to, and parallel to, the private road with little maneuvering and turn around area. The wastes are scattered over a large area with heavy bulky items reported up to 100 feet beyond the pit and within the tree line. The site has a natural spring running right through the dumping area, no visible fire break, and the odor, fly, and animal problems associated with open dumps.

Petrolia-Honeydew Dump Site--The Petrolia-Honeydew site services the ranches and summer homes scattered around and within the valley areas occupied by the communities of Petrolia and Honeydew. The dump is located off a county-maintained road near the peak of the mountain range separating the valley regions. The county leases the land on a 3-year basis, with options to extend the lease. The owner has purposely limited the lease to the 3-year period to force the county to maintain the site in an adequate manner and to construct improvements (i.e., cattle guard, pit fencing, site fencing, and litter control facilities) he deems necessary to preserve an acceptable appearance. Considering the extreme wind conditions normally associated with this mountainous and remote area, the site has a relatively clean appearance with minimal odor, fly, and animal problems.

Thorn Dump Site--The Thorn site is a trench type open dump. It's located on flat terrain, has adequate fire clearances and turn around areas, is burned and covered on a regular basis, and is concealed from public view by a grove of trees. The site is located within 1/4 mile of the so-called community center--the White-Thorn post office and general store--and is accessible from a main thoroughfare (Briceland Road). Although a few flies and crows were reported, along with a barely detectable odor, the site is unquestionably the most acceptable of the six rural sites surveyed. The general roadside conditions along the Briceland Road, however, were poor with litter counts as high as 300 items per 1/2 mile.

Garberville Dump Site--The Garberville dump is the largest and most active dump in southern Humboldt County. It is located approximately 1 mile east of the community of Garberville off the Alderpoint Road at the head of a moderately sloping swale terminating in a stream. The face of the dump is on the downhill side of a sheer vertical earth wall some 100-feet high; the county constructed a concrete dumping platform to prevent residents from backing off the edge. The site is pictorially described as the only "air-injected dump site in America." The site burns and smolders year-round, generating a significant visibility problem at the dumping area. The steepness of the terrain prevents routine maintenance; the burning apparently limits vector problems (Figures 27 and 28).

Figure 27. Burning dump at Garberville.

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Figure 28. Burning dump at Garberville.

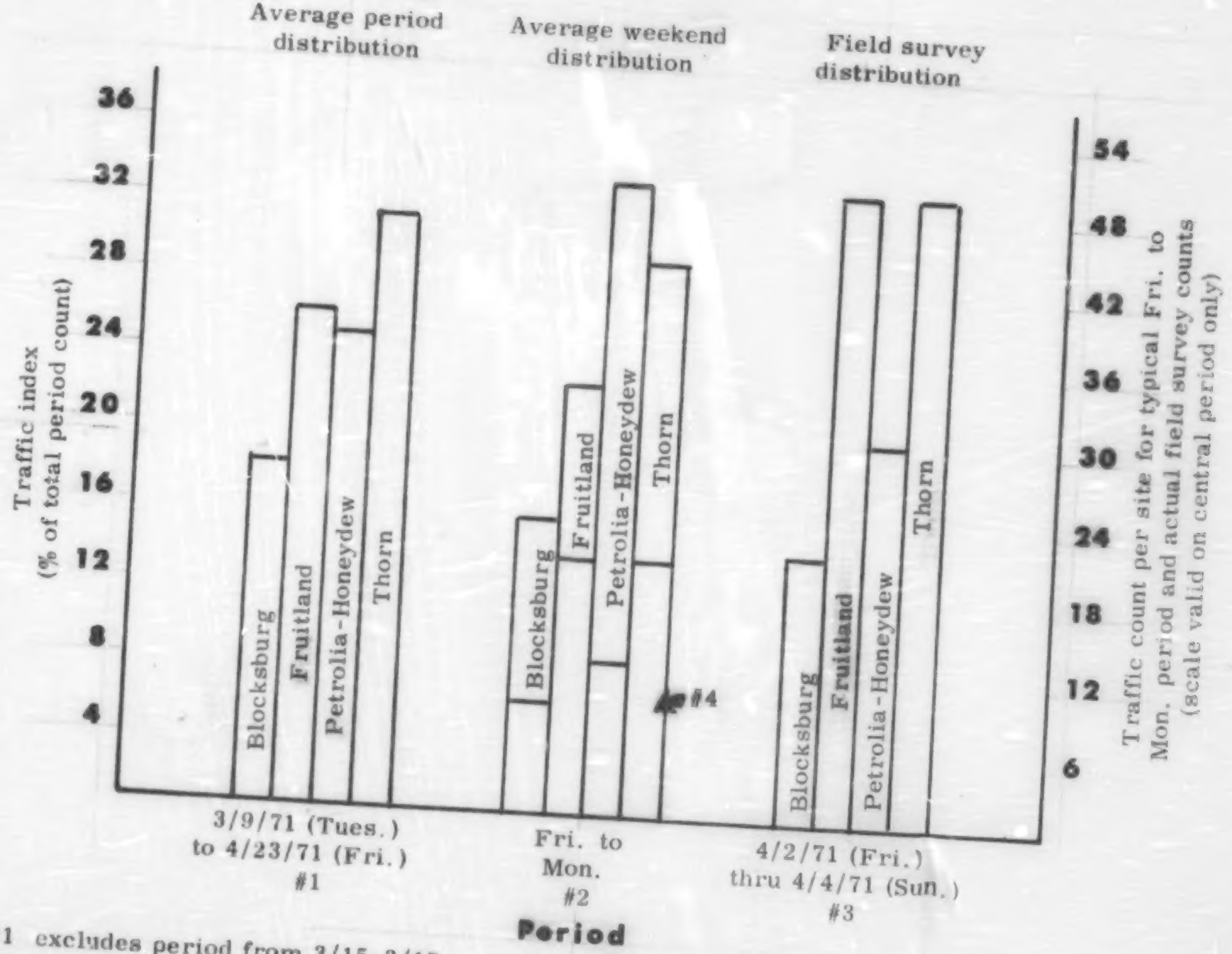
Field Results. The field results presented are based on the user practices observed in the field, student impressions, and resident opinions and comments. The raw data derived from the public usage studies and traffic surveys is summarized in Appendix D, Exhibits 12 and 13.

In applying these results and behavior modes to other areas, the reader must recognize the basic aims of the field studies and the resulting limitations of the findings (i.e., sample size, seasonal effects, and training and proficiency of field investigators).

Site Environment: The six dump sites surveyed were found typical of the disposal sites prevalent in the low-density and semirural areas of Humboldt County. Although they individually varied in overall appearance, natural environmental constraints (i.e., terrain, wind velocity, drainage, and access), physical improvements (i.e., fencing, grading, cover, and fire zones), and design (i.e., selection by county or native population), the prevailing conditions were toally unacceptable from an environmental, operational, health, and safety viewpoint. The more common hazards included flies and yellowjackets, vectors and birds, natural springs and creeks running adjacent to or through the site, litter along the access road, and blowing papers.

Site Usage During On-site Field Surveys: The overall traffic counts for the 3-day survey period were on the average less than 60 percent of the normal period usage. The traffic volumes varied from a low of nine vehicles at Blocksburg to a high of 32 vehicles at Alderpoint; the central dump at Garberville reported 144 users.

Figure 29, Normalized Traffic Counts, illustrates the relative traffic distribution between the four sites during three periods (vehicle monitoring period [6 weeks] , average 3-day weekend period [Friday through Sunday], and 3-day survey period [Friday through Sunday]), and the actual traffic counts per site for the typical Friday through Sunday period and the field surveys. A review of the traffic indexes (percent of traffic reported at each site in relation to total period) presented in this chart indicate that the distribution of traffic between the sites did, within limits, remain fairly consistent. It is felt that although the usage during the field surveys varied from 25 to 60 percent of the normal usage (Blocksburg--40 percent, Fruitland--60 percent, Petrolia-Honeydew--25 percent, and Thorn--45 percent) the practices observed and comments recorded are typical of the sites' tributary population. The apparent reasons for the discrepancy between the metered counts and visual observations during the field surveys were the fact that the observation period was limited to 9:30 a.m, to 4:30 p.m., (to allow the students sufficient driving time during daylight hours) and the fact that the survey occurred during a holiday period. Contrary to original impressions, site usage was off during the holiday period rather than being at a peak. From a statistical and informational viewpoint, the surveys should have run until dusk to account for the flux of late afternoon users.



#1 excludes period from 3/15–3/17
#2 average of 3/12–3/15 & 4/23–4/26
#3 based on student observations
#4 actual field survey counts

Figure 29. Normalized traffic counts

Waste Volumes: The estimated solid waste volumes on a site, total, and vehicle basis, are illustrated in Table 6, Estimated Solid Waste Volumes Per Site. These volumes are based on actual container counts, assumed unit volumes per container type, and estimated loose yardage. They are presented for illustrative purposes only; the difficulty the students encountered in accurately estimating the volume of the loose and the bulky wastes coupled with the obvious limitations of assumed unit container volumes, limits their potential usefulness and application to conceptual, not design, activities. The derivation of accurate tonnage figures and respective generation rates for rural areas will be accomplished during the subsequent testing and evaluation period.

Waste Characteristics: The typical wastes brought into, and reported at, the rural sites include those categories normally associated with urban solid waste disposal sites--organics, household refuse, yard trimming, ashes, cardboard products, debris, bulky items, and miscellaneous wastes. The striking and significant differences appear to be in the wastes' respective composition including: (1) the high percentage of wet garbage and nonburnable packaging materials (i.e., tin, aluminum, bimetal, and glass containers) rather than the more common paper and paperboard products found in residential type wastes; (2) the predominance of oversized and bulky wastes (i.e., stoves, refrigerators, beds, water heaters, and household furniture); and (3) the large number of dead animals (i.e., calves, sheep, cats, and birds).

The proportion of paper and timber products in the typical loads deposited at the dump were low because residents burned these materials in their home furnaces and fireplaces or on their premises rather than carting them to the dump. The on-site interviews indicated that some 25 percent of those queried burn some or all of their papers.

The high percentage of wet garbage evidenced at the sites and observed by the students was the one major surprise of the 3-day survey (Appendix D, Exhibit 12). Intuitively, one would expect rural residents who lived miles from the nearest dump site to dispose of their odorous wet garbage on a daily basis within the confines of their own property rather than storing and hauling the organics in their private vehicles on a weekly or semimonthly basis. Although a few residents reported that they do, in fact, compost their organics (one individual raises worms), the great majority implied they brought all their wet garbage to the dump.

Perhaps the most significant field observation, in terms of potential effect on design and routing of the containerized collection equipment, was the unusually high quantity of large household items, metallic debris, and dead animals brought to the sites during the 3-day period. Excluding the central dump site at Garberville, the students reported, out of a total traffic count of 92 vehicles, seven full pickup loads of scrap metal, construction debris, and large household items (stoves, refrigerators, etc.); five dead animals, including sheep, cats, and calves; and numerous miscellaneous bulky wastes.

TABLE 6

ESTIMATED SOLID WASTE VOLUMES PER SITE

Site	Volume of waste (cubic yard)		Containerized waste (cubic yard)	
	Total	Per vehicle	Total	Per vehicle
Alderpoint	19.0	0.61	4.5	0.15
Blocksburg	3.0	0.33	2.0	0.20
Fruitland	19.3	0.97	4.0	0.20
Petrolia-Honeydew	10.4	0.87	3.5	0.30
Thorn	29.6*	1.48*	17.5*	0.88*
Summary - Rural Sites	81.1	0.88	31.2	0.34
Garberville	93.4	0.65	31.2	0.22

*Quantities questionable; field data from student stationed at this site was generally poor.

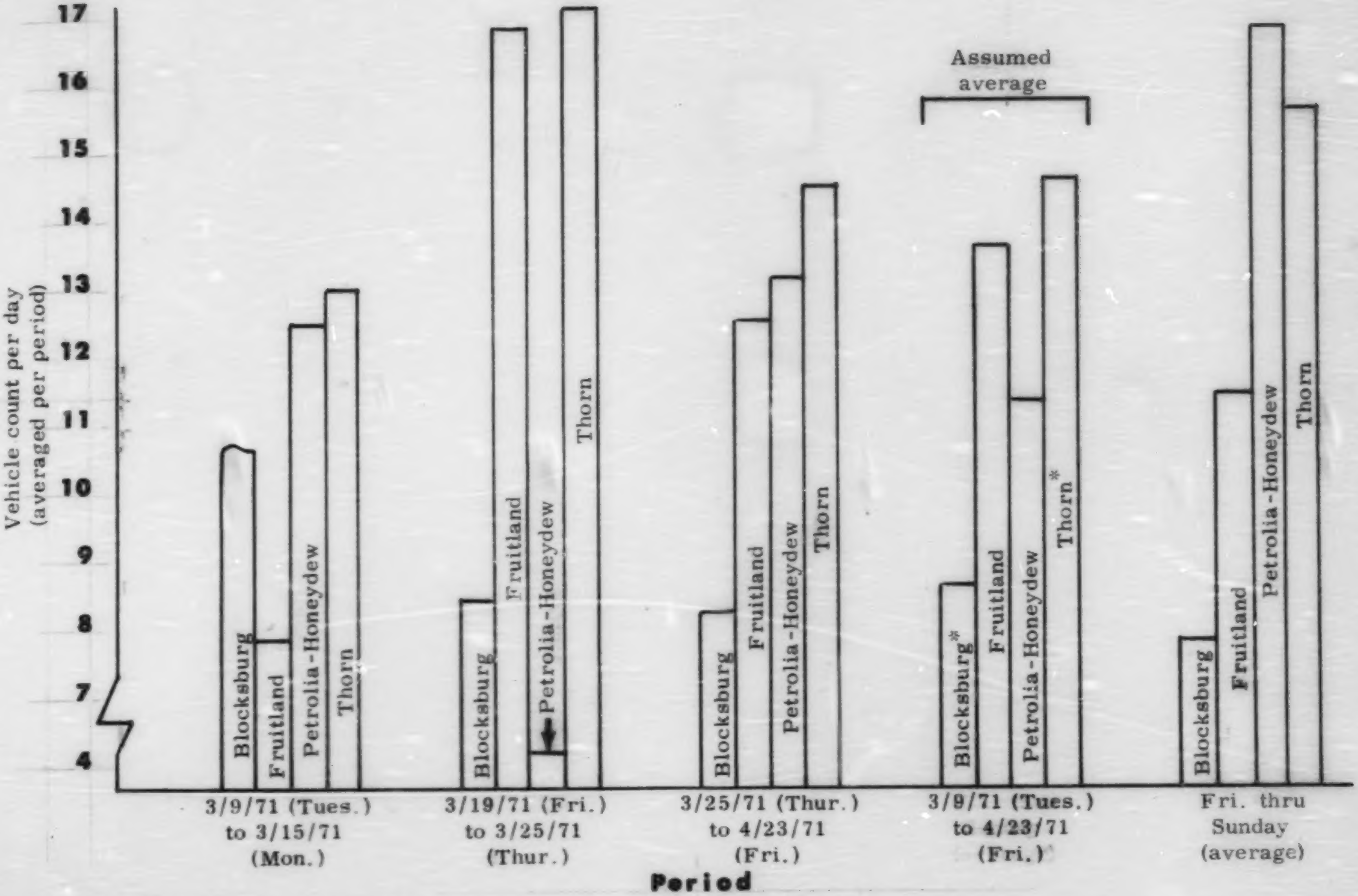
Traffic Patterns: The daily vehicle counts, averaged by period, at the four rural sites metered are summarized in Figure 30 (Alderpoint was not metered because of access conditions). The chart illustrates the extreme range and fluctuations in usage during the respective periods and the variance between average weekly usage and average weekend usage (Friday through Sunday). These variances range from little, if any, change at Blocksburg and Thorn, to significant changes at Petrolia-Honeydew. The assumed daily usage at the sites was based on the total monitoring period (Appendix D, Exhibit 13); the travel times and distances between the sites prevented the development of vehicle counts based on daily readings.

Utilizing the results of the monitoring and survey programs, personal observations in the field, and familiarity with the characteristics of the respective tributary areas, a basic picture of the traffic patterns at each site was formulated to aid in scheduling and routing the collection equipment. Table 7, Estimated Site Usage, illustrates the expected range and average usage of the existing dump sites and the proposed container sites on a daily and weekly basis.

The Alderpoint dump services a generally fixed population within the community of Alderpoint (across the river) and the adjacent valley area. The location of the site on the Alderpoint Road permits easy and frequent usage with little variance in daily traffic during Sundays and the week days; the normal peak Saturday usage was reflected in the limited data available. This site was not monitored because of problems in locating the counters. The average resident frequents the site on a weekly or biweekly basis and travels less than 3 miles.

The location of the Blocksburg site in relation to the community and principal thoroughfare (Alderpoint Road) parallels the Alderpoint situation. The primary differences are the small tributary population the site serves and the fact that it is not used on Sunday; the Blocksburg general store (only one in the area) is closed on Sunday. The usage of the site should be fairly consistent throughout the year. The average resident travels less than 2 miles (5 to 10 minutes) and frequently visits the site from four to eight times per month.

The Fruitland site services two distinct tributary areas--the contiguous rural population within relatively short haul distance, and the more distant and urbanized populations along Highway 101, including the communities of Miranda, Phillipsville, Myers Flat, and Weott. These latter communities are within a franchised collection area and residents normally restrict their usage to debris and nonhousehold type wastes on the weekend. The resulting traffic patterns indicate that the weekend period, predominantly Saturday, accounts for more than one-half of the estimated weekly usage and the majority of the wastes by volume. The total usage of the site on a weekly basis over the 6-week period, varied by a factor of two (55 to 120 vehicles per week). The site is frequented by local residents on a weekly and bimonthly basis and by commercial establishments along Highway 101, the principal users, as often as 10 to 12 times a month.



*excludes period from 3/15–3/19

Figure 30. Metered traffic counts

The Petrolia-Honeydew site services two fixed communities in adjacent valleys (Petrolia and Honeydew) and a substantial transient population occupying second homes (principally summer homes) scattered throughout the area. The permanent residents utilize the site on a monthly or bimonthly basis (principally during the week) and travel up to 10 miles (30 minutes) to the site to deposit substantial loads. The transient residents frequent the site on an occasional basis (monthly or longer), travel shorter distances, and deposit relatively insignificant volumes; some transients haul their wastes back to their permanent residence. The resulting weekly usage can vary by a factor of three with peak traffic volume on Sunday; the traffic patterns' overall effect on waste generation rates is apparently minimal.

The Thorn site services one distinct community, is centrally located, and adjacent to the principal road. Its utilization by local residents appears to be evenly distributed throughout the week and fairly consistent from week-to-week. The average user travels less than a mile or two and frequents the site on a bimonthly basis.

The Garberville dump services the greater Garberville area including numerous rural areas scattered throughout southern Humboldt County. The residents living close to Garberville (i.e., Redway and Benbow) regularly use the site on a weekly or biweekly basis and favor late afternoons and weekends. The outlying residents apparently utilize the site on a monthly, or less often, basis, usually on weekdays. They traveled up to 30 minutes and/or distances of 15 miles.

Travel and/or Distance Constraints: Permanent residents utilizing the dumps on a regular basis appear to be willing to travel up to 8 to 10 miles, one way, on paved two-lane typical rural mountainous roads, approximately 30 minutes travel time. The norm among those rural citizens surveyed at the sites appears to be in the range of 10 to 15 minutes travel time. The percentage of residents actually utilizing the dumps and located within an 8-mile radius could not be ascertained with the limited data available. It's mere conjecture at this point, but the staff believes the rural residents' link to nature, need to traverse the distance for acquiring goods and services, and reliance on the pick-up for the principal mode of travel (no storage problems) dictate an exceptionally high utilization rate by even the most distant residents.

With the transient and second-homeowners there appears to be a direct link between convenience (travel time and/or distance) and usage. Those areas with higher transient populations have significantly more litter and indiscriminate roadside dumping.

Individual Dumping Habits: The average rural citizen's profile and dumping habits are graphically protrayed in Figures 31 and 32, Summary of Public Usage Studies of Rural Dump Sites. The figures are derived from the observations and physical counts recorded by the student teams at five rural sites--Alderpoint, Blocksburg, Fruitland, Petrolia-Honeydew,

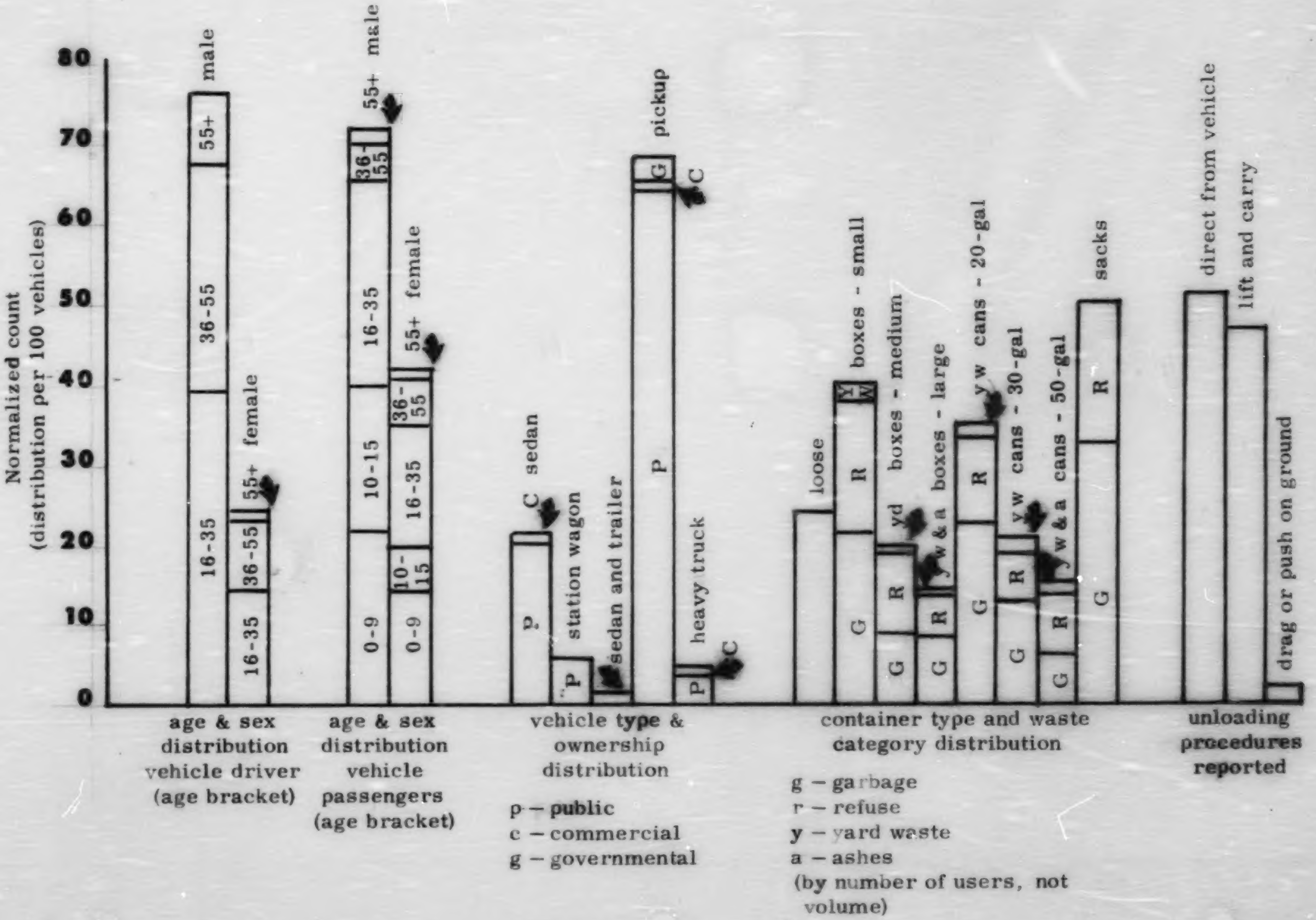


Figure 31. Summary of public usage studies of rural dump sites

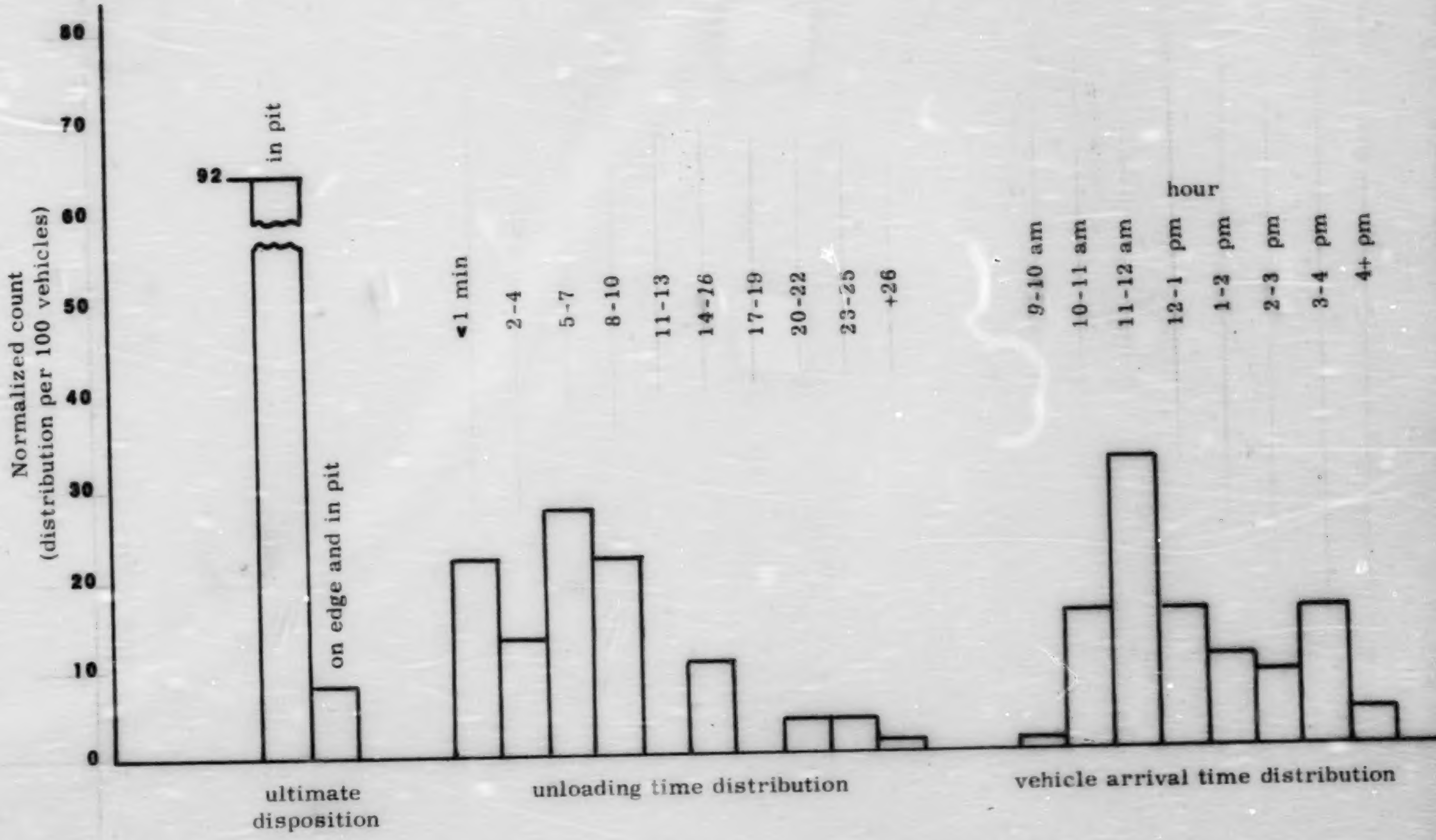


Figure 32. Summary of public usage studies of rural dump sites.

and Thorn--on items 31 through 52 of the Field Survey Report--Public Usage Studies (Appendix D, Exhibit 12). A review of the data and descriptive information paints the following picture of Mr. Average Dumper.

A male, between 16 and 35 years of age, accompanied by 1.15 passengers or helpers--principally children (30 percent) and teenagers less than 16 years of age (25 percent). Predominantly utilizes a pick-up truck (seven out of ten), dislikes trailers, and transports the wastes in a combination of storage containers, including boxes, cans, sacks, and in a loose state. Prefers to discharge the wastes directly from the vehicle but, due to the site configurations, will generally be required to lift and carry those items and containers that cannot be unloaded without undue spillage. Normally insists on depositing all the wastes within the confines of the pit. Arrives at the site throughout the day with preference for midday and late in the afternoon. On the average spends less than a total of 8 to 10 minutes at the site.

Public Attitudes: The prevailing attitudes of the rural population appear to center on the appearance and maintenance of the dumps rather than their basic environmental hazards. The concensus among those interviewed was that if the dumps could be located to avoid unloading problems, designed to contain the waste, and burned on a regular basis, the residents would have no basic objection to their continued use. These conclusions were revealed in the relationship between the sites' overall appearance and residents' comments. Table 8, User Attitudes, summarizes the study teams' impressions of the maintenance practices and site improvements of the respective dumps in relation to the reported attitudes of persons interviewed. There appears to be, understandably, a direct correlation between these variables.

At the Petrolia-Honeydew, Thorn, and Fruitland sites there were few, if any, major complaints about the dumps. Typical comments included "it's a fine dump," "it's a nice dump," "good the way it is," and "quite happy with the dump--no rats or odors." The typical complaints included a "lack of a back-up stop so vehicles won't fall in pit," "muddy in winter," and "sometimes the garbage is too high and needs to be pushed back because people throw garbage on the ground instead of into the pits." Although the Fruitland site is substantially less ideal than Petrolia-Honeydew or the Thorn sites (Table 8), the lack of user dissatisfaction is attributed to the fact that a good percentage of its tributary population live outside its environment--along Highway 101. The majority of the complaints against the Thorn dump were centered around the need for regular maintenance and adequate site cleanup; one person suggested "moving the site closer to Briceland."

On the other hand, Alderpoint and Blocksburg residents were generally unhappy and quite dissatisfied with the dump. The most common complaints included: "an eyesore, polluting river, garbage not put in pit"; "eyesore, remove off road"; "unsightly"; "washes into river"; "terrible"; "pollution"; "it's a bad mess--been here too long--Humboldt County is way behind the

TABLE 7

ESTIMATED SITE USAGE

Dump Site	Daily usage (No. vehicles)		Weekly usage (No. vehicles)	
	Range	Assumed avg.	Range	Average
Alderpoint	-	21.0*	-	150*
Blocksburg	8.1 - 10.5	8.5	55 - 75	60
Fruitland	7.7 - 16.7	13.5	55 - 120	95
Petrolia-Honeydew	4.0 - 13.0	11.2	30 - 90	80
Thorn	12.8 - 17.0	14.5	90 - 120	100
Garberville	40.0 - 70.0	45.0	280 - 490	315

*Based on limited data obtained during 3-day field surveys, assumed 1.5 times Fruitland and Thorn usage

TABLE 8

USER ATTITUDES

Site	Degree of Maintenance*	Site improvements and appearance*	Reported attitudes		Total
			Satisfied	Dissatisfied	
Alderpoint	Poor	Very poor	5	16	21
Blocksburg	Very poor	Poor	1	7	8
Fruitland	Fair	Poor	10	2	12
Petrolia-Honeydew	Good	Good	10	1	11
Thorn	Good	Fair	9	8	17

*Range: good, fair, poor, and very poor.

times in so many ways"; "real mess--myself included"; and "eyesore--stench--litter on highway--unhealthy--flies." The only interviewee at Blocksburg who replied in the negative, said "who'd complain about a dump?" and then added, "it is an eyesore, though."

Suggested improvements and modifications to bring the dump up to their expectations included, "move the dump away from the river and off the road"; "burn more often--build retaining wall and fence to contain blowing papers"; "keep wastes out of stream"; "get cleaned up"; "make into a landfill"; "fill up and cover"; and "dump should be constructed so trash does not end up in creek--provide means for vehicle to back up and dump wastes without fear of going off embankment."

Social Constraints: There appears to be a unique social relationship between the dump and its tributary population. Unlike their urban counterparts, the rural citizens have complete and individual control over the storage, transportation, and disposal of their waste products. They have a personal concern with the sites' appearance and their neighbors' disposal habits due to their proximity and frequent, if not daily, contact with the dumps. And they have an intimate involvement with the dump in that it was naturally selected, in most cases, by their own acquiescence. Further, the dump offers the community a meeting ground, a place to visit and chat with neighbors, drink beer, and shoot a few crows and squirrels. It provides amusement for the children, an excuse to take a late afternoon drive to town, and an opportunity for the whole family to work together on a common task.

These factors linked with the isolated nature of the communities and their citizens' basic self-reliance generate a strong relationship between the rural population and "their" dump. It should be evident that under these social conditions that attempts to alter, relocate, or modify the existing dumps without prior acceptance by and input from the local populace will be self-defeating and to no avail. The residents will undoubtedly maintain their old dumping patterns, utilize the old site, and generally oppose the prime aim--to improve solid waste management practices.

Relying on the validity of the students' impressions and with these factors in mind, a public information program was designed and aimed at the rural citizens. Its prime intent was to motivate and utilize the concerns and energies of the communities to further, not impede, the aims of the project. The program was conducted by members of the Project Advisory Committee and reached into the most remote areas of the county through the media of town meetings. Its success, in terms of public cooperation, motivation, education, and assistance in maintaining a suitable environment around the container sites, will be evident during State II (Operation and Evaluation) of the project. It is clear at this time that the program had one dramatic result--it partially dispelled the historical, and perhaps valid, belief that regardless of local demands and needs, the county would pursue its own policies. The local residents were clearly informed of the nature of the project, its dependence on local support, and asked to help test and design a system that best fits their needs within the economic and regulatory constraints.

Reaction to Containerization: The general reaction of those interviewed to containerization was one of indifference (i.e., "wouldn't matter, but if better, okay"). Although most residents had no objection to the basic containerization concept (excluding the cost and relocation factors), they believed it would be better to improve and clean up the existing dumps. The few individuals who did not want the dumps replaced with containers either (1) objected to the inconvenience of a change; (2) did not think the system would work because people would be just as messy and leave the wastes everywhere but in the bins; or (3) believed that they could not get their bulky and large items in the containers. One resident was upset because the new system would prevent salvaging.

Predictably, the principal objections were based on the byproducts of the containerization of the waste disposal system--namely, the necessity to relocate the sites and the additional cost or tax burden imposed on the area. The residents utilizing those sites to be relocated (Thorn and Alderpoint) strenuously challenged the necessity and validity of constructing the container sites on parcels other than the existing dump sites; they wanted the dump to remain in the same place. The reasons expounded included: (1) the difficulty in re-educating and redirecting the entire population to a new location--a single dissenter could effectively prevent the county from phasing out the old dump; (2) the additional costs required to purchase new property; and (3) the inconvenience of altering their life styles--the people are used to, and comfortable at, the present dump. As one individual replied, "it's like losing an old friend."

Surprisingly enough, not all those interviewed confirmed the heretofore generally accepted axiom of "progress--but without costs." In fact, over one-half of the residents indicated that they would pay a reasonable amount to improve their environment; the majority of these individuals were at the most offensive sites. Favorable reactions included, "if good for community--wouldn't mind paying my share"; "a reasonable amount"; "don't want to pay a lot"; "if I had to, okay--through taxes"; and, "I don't mind if pay-as-you-go, or on tax roll." A plausible reason for these unusual responses may be that the rural resident is closer to his environment than his urban counterparts and thus more willing to impose an additional burden on himself. The typical negative reaction included "no more taxes"; "why change at all?"; "wouldn't pay"; "if taxed, would be most unhappy"; "too much taxes"; "no money"; "I like being able to dump free"; and, "with all the property sales, and income taxes already imposed, some wastage could be eliminated and used for projects like this."

Conclusions. The identification of those key social and physical constraints materially affecting the design, implementation, and operation of the containerized refuse collection system stands as the major achievement of the 3-day field surveys. Although the "scientific nature" of the field surveys leaves much to be desired in terms of professional field interviewers, the number of open-ended questions and sampling procedures, the significance of the feedback illustrates the need to provide an effective channel of communication with those individuals being directly affected by the project. The obvious benefits of appraising, and hopefully considering the needs, desires, and basic attitudes of the rural residents through any set of functional procedures, far outweighs the need to conform to accepted, elaborate, and costly attitude and behavioral studies. We urge other agencies involved in projects directly or indirectly affecting peoples' life styles to utilize potential free survey resources, including neighboring universities and colleges, youth groups, and a host of environmentally-conscious associations.

The following conclusions are based on the interviewers' comments, recorded data, field observations, and personal familiarity with the area.

(1) There exists a discernible and viable link between the rural residents in southern Humboldt County and their refuse dumps. This link is principally manifested in terms of the dumps' social prominence and central position in the community.

(2) The implementation of a rural area containerized collection system extends beyond the realm of engineering effective sites and selecting related collection equipment. It includes the "implied" goal of altering the life styles of the area's rural citizenry. Such a goal can only be attained with the "direct" participation of those being affected.

(3) The principal reactions to containerization centered around the necessity to relocate the dump site and concern over getting the large bulky wastes into the containers. In general, the educational and enforcement efforts associated with the implementation will be greatly reduced if the sites are not relocated.

(4) The unexpected environmental attitudes and concern of the rural resident for improving the conditions of the dumps offer a viable vehicle for selling the benefits of the program. Unlike his urban counterpart, the rural resident's personal control over the collection and disposal process bring him into frequent contact with the dump environment.

(5) The field data indicated a direct correlation between user attitudes and dump maintenance; the results showed user dissatisfaction increased proportionately with deteriorating site conditions.

(6) The predominant waste materials disposed of during the field surveys included an unusually high percentage of wet garbage, bulky and oversized wastes, and dead animals. These materials will present major operational problems--i.e., maintaining adequate

storage, preventing vectors and flies, and routine cleaning requirements.

(7) The apparent traffic patterns at the rural sites were directly related to the tributary population's life styles (i.e., fixed or transient); the peak traffic counts indicate a preference for late afternoon and weekends. The total traffic count at the individual rural sites ranged from 30 to 120 vehicles per week.

(8) A maximum effective service district for the container sites appears to be in the neighborhood of 8 to 10 miles, one way, or 30 minutes traveling time.

(9) Surprisingly enough, over one-half of those interviewed expressed a favorable attitude towards incurring the costs to improve the dumps.

Public Information Program

The public information program was coordinated on an informal basis from June 1970 through February 1971, when the concepts for an effective program were developed by the consultant and the Project Advisory Committee.

During the informal period, efforts concentrated on presenting the general concepts of the project on a countywide basis. Two press releases were issued when the project was initiated, and subsequently, presentations were made before various groups and clubs within the Arcata, Fortuna, and Eureka areas.

A public meeting coordinated by the Garberville Chamber of Commerce was held in Garberville on October 14, 1970, for all residents of the Garberville and surrounding communities. Concepts, proposed schedules, and anticipated benefits of the solid waste demonstration project were outlined. Information regarding the central sanitary landfill were discussed, and a request was made for the assistance and cooperation of all residents in the location and acquisition of a suitable site in the Garberville-Redway area.

The following visual aids and displays were developed during this period:

- Map illustrating existing dumps and the proposed container sites within the demonstration area. (Figure 33.)
- Poster illustrating the alternative concepts evaluated during the feasibility study.
- Poster illustrating the previous practices and the concepts of the demonstration project. (Figure 34.)

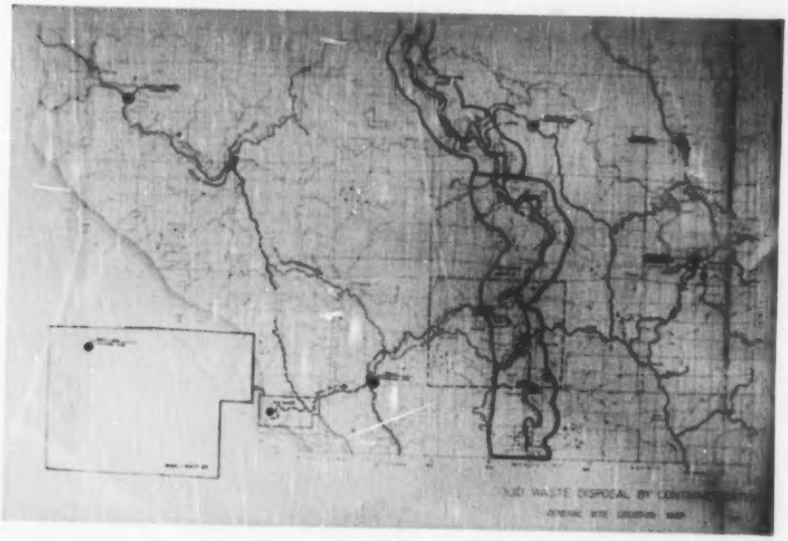


Figure 33. Map of Humboldt County

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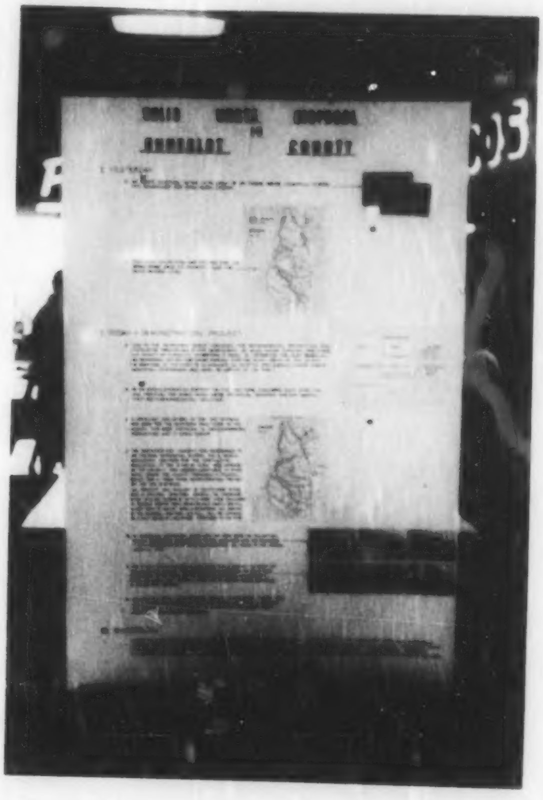

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Figure 34. Poster describing previous practices, the demonstration concept, and probable future concepts.

- Scale model of a typical containerized disposal site for demonstrating the public use of the 8-cubic-yard and 40-cubic-yard containerized systems and the collection truck servicing them. (Figure 35.)

During February 1971, the Project Advisory Committee reviewed the initial draft of the public relations program developed by the consultant, and a preliminary copy of a press release proposed for countywide distribution was prepared. Revisions, additions, and suggestions were made for insuring that the residents of the demonstration area would be aware of the project.

In early March an extensive countywide report on the project was coordinated with the various news media to inform all county residents of the need for, and the concepts of, the demonstration project. Information was also disseminated regarding the proposed on-site surveys of existing dumps for the residents of the demonstration area. The activities for local press coverage included:

(1) A display of the visual aids coordinated with the local branch of the American Society of Civil Engineers during Engineers Week.

(2) Progress report before the Board of Supervisors, presented by the Department of Public Works, utilizing static displays, a film on the collection equipment, and a draft of a press release describing and illustrating the proposed system.

(3) Notice of on-site survey to be conducted during the latter part of the month.

Press coverage included news coverage on both local television stations and the Times Standard newspaper.

Upon completion of the container site surveys, mechanisms for informing residents of the demonstration project area were developed. The main concept was to use a "Town Hall" meeting program. Project Advisory Committee members assisted in developing and arranging for the meetings, community leaders coordinated the meetings, and local papers and other news media were utilized to advertise all meetings. Posters were also used in the local stores and post offices. Each program included the use of slides, models, and other static displays to illustrate the need, cost, and proposed development and operation of the containerized system.

The "Town Hall" meeting concept was well received by the various communities, primarily because:

(1) A community leader was informed of the project and had printed information that could be reviewed and discussed by the local residents prior to and after the meeting dates.

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Figure 35. One-quarter scale model of a typical containerized disposal site.

(2) Local residents generally responded to and openly discussed information more extensively when obtained from community meetings rather than from the major newspapers. Most of the leaders indicated a willingness to coordinate future meetings, and several noted that their group would be willing to also assist in reporting field conditions and/or problems after the initial operations commenced.

Subsequent activities of the public information program were limited to reporting the progress on property acquisition and the status of pending construction contracts. Press releases in June 1971 included extensive coverage by local radio, television, and newspapers on the need to acquire land for the central sanitary landfill.

Both project personnel and the Advisory Committee concluded, with certain exceptions, that the first year of the public information program was basically successful. Although the local newspapers expressed interest and assisted in many ways to insure that prepared releases were successful, several major releases did not receive warranted publicity, and some news coverage was negative. No news articles related to the project were reviewed by project officials.

Also, although a majority of the residents accepted the proposed containerized system and favored this concept, there was a general public reluctance to accept assurances that the container and central landfill sites would be continually operated. Many people recognized a need for improvement but expressed concern that the general public would incorrectly utilize or be unwilling to finance the project on a continuing basis.

Future public information programs will be directed at resolving such concern in the demonstration area or in other communities where similar projects might be implemented. Also, a continual liaison between the Advisory Committee and the local press will be stressed to minimize detrimental news articles.

APPENDIX A
EXHIBIT 1

LIST OF PROJECT ADVISORY COMMITTEE MEMBERS

Donald R. Andres, P.E., Associate Sanitary Engineer, Bureau of Vector Control, California State Department of Public Health

Richard Milbrodt, County Administrative Officer, County of Humboldt

Mrs. William (Nancy) Hilfiker, Member, League of Women Voters

William A. Jamieson, State Forest Ranger, California Division of Forestry

Alan D. Philbrook, District Superintendent, California State Department of Parks and Recreation

Charles P. Sassenrath, Director, Humboldt County Air Pollution Control Board

Richard A. Sherman, Director of Environmental Health, County of Humboldt

Dan Walters, City Editor, The Times Standard, Eureka, California

Department of Public Works:

Guy C. Kulstad, Director of Public Works, County of Humboldt

Fred W. Cope, Associate Civil Engineer (Project Director) County of Humboldt

Detailed Task Procedures

1) Reconvene Project Advisory Committee

The Advisory Committee which was formed during Phase I of the project will act in its original capacity, namely, to guide and review the demonstration program and to coordinate the activities of the various participating agencies. In addition, the Committee will be responsible for coordinating the public information program to insure that all permanent and transient residents will be aware of the new refuse collection and disposal system. It will also aid in the selection of the ultimate use concepts for the sanitary landfill.

2) Establish Technical Advisory Committee

The purpose of this task is to establish a Technical Advisory Committee to guide the comparative evaluation program and review all system designs. This Committee is distinct from the Project Advisory Committee in that the latter is concerned with general project coordination and guidance, while the Technical Advisory Committee is specifically concerned with the detail engineering and testing aspects of the project and administation of the seminars. Present plans call for the Committee to be composed of representatives from the following agencies:

a) Public Works Department, County of Humboldt;

b) Solid Waste Engineering Section, Bureau of Vector Control and Solid Waste Management, California Department of Public Health;

c) Bureau of Solid Waste Management, Environmental Control Administration, Consumer Protection and Environmental Health Service, United States Public Health Service, Department of Health, Education and Welfare;

d) Garretson-Elmendorf-Klein-Reibin, Architects-Engineers;

e) Bartle Wells Associates, Municipal Financing Consultants.

3) Detail Testing Program

The objective of this task is to detail the testing program to insure the rational development and logical accumulation of all

necessary comparative engineering data. Such data will relate to the operational and functional characteristics of the sub-systems by themselves and also as components of the integrated storage, collection, and disposal systems. The delineation of the testing program will include: (1) the division of the test area into two sub-regions, based on travel times and weekly refuse volumes, (2) the selection of the type of transfer facility to be built at each site, (3) the specification of types of containers and servicing schedules at each site, (4) sequential arrangement of special test programs, surveys, and evaluation programs, and (5) determination of types and nature of statistical data required to evaluate the system. Present plans call for the Technical Advisory Committee to review, detail, and select the testing program to be used throughout the demonstration period.

4) Commence Public Information Program

The primary functions of the public information program are to inform and educate the general public in the demonstration area as to the nature and purpose of the pilot program, the areas designated for container sites, the source of funds, and the expected results; also, to pave the way for sanitation surveys and other questionnaires and data gathering surveys that entail personal contact with the general public. The news media, leaflets, and posted signs will be used to accomplish these ends. A public relations consultant and the Project Advisory Committee will have major input into this task.

5) Site Acquisition and Right-of-Way Negotiations

The purpose of this task is to negotiate and purchase the necessary container and central landfill sites. Of the nine container sites, seven are to be provided at no cost to the project: Three (Thorn, Fruitland, and Petrolia) will be constructed on existing County-owned property; one (Shelter Cove) will be provided by the land developer; and three (Benbow, Richardson's Grove, and Humboldt Redwoods) are to be provided by the State of California Parks and Recreation Department. The remaining two container sites will require approximately 1-1/2 acres each, while the central landfill site will require approximately 35 acres.

6) Develop Final Plans and Specifications for the Containerized Storage and Collection System

a) Design container facilities: The six* container facilities to be designed and constructed shall conform to the basic configurations designated as Type IIA and Type IIB. The development of final plans and specifications will entail the following tasks:

(1) Site surveys.

(2) Investigation of alternate construction materials.

* Three container facilities are to be provided by the State of California Parks and Recreation Department at no cost to the project.

(3) Construction drawings including provision for:

(a) Drainage.

(b) Fire control.

(c) Fencing.

(d) Access roads.

(4) Design, location, and installation of signs.

b) Select containers: The containers purchased for the demonstration program will consist of either 8 or 40 cubic yard standard bins. In order to accomplish this comparative evaluation program envisioned for the project, present plans call for the selection of approximately 30 eight cubic yard containers (15 with hinged lids and 15 without) and 6 forty cubic yard containers (3 with lids and 3 without).

c) Design container wash system: The function of this task is to design, or select from manufactured equipment, a truck mounted container cleaning device that can be utilized on both the 8 and 40 cubic yard containers. This system will be operated manually by the truck driver. The 40 cubic yard bins may be cleaned at the active face of the landfill site with the effluent discharged into the refuse or in special drainage ponds. The 8 cubic yard bins will be cleaned at the container site while the empty container is above the compaction body hopper with the effluent draining into the compaction body.

d) Select collection vehicle: In order to reduce the overall cost of the test program, we have tentatively selected a vehicle that is capable of servicing both the 8 cubic yard bins and the large drag-on containers. This vehicle is described in the Appendix. It consists of a Dempster "Dumpmaster" body (30 cubic yards), mounted on a "Dinosaur" understructure, and equipped with hydraulic snap-on connections. When hoisted into operational position on the Dinosaur, the "Dinomaster" hydraulic lifting arms and packer plate are activated by attachment to the Dinosaur hydraulic system. A review of alternate equipment will be made, but to date this is the only piece of equipment we know of that can satisfy our requirements and that is a standard shelf item. An important part of this task will be the selection of a chassis that will meet the geographical and system requirements, (terrain, road conditions, weather, space requirements at container site, low maintenance, etc.).

e) Design of maintenance facility: The maintenance facility will be located at the sanitary landfill site because of its central geographic position with regard to the collection routes. It will be designed to provide maintenance for the collection truck, landfill equipment, and the containers, and will also provide enclosed storage for the collection and landfill equipment. It is envisioned that the structure will be a simple metal type building.

7) Develop Final Plans and Specifications for Centrally Located Sanitary Landfill

The objectives of this task are to design the sanitary landfill, including:

a) Determination of the soil and ground water characteristics to accurately predict ground water elevations and type and availability of cover material.

b) Selection of the final contours of the site based upon ultimate use concepts recommended by the Project Advisory Committee.

c) Recommendation of specific landfilling procedures and techniques reflecting availability of cover material, terrain, soil and ground water characteristics, refuse quantities and characteristics, meteorological conditions, and estimated life of fill compatible with guidelines set up by the Technical Advisory Committee.

d) Design of appurtenances at landfill, including drainage facilities, fencing, all weather access road, scale, utilities, and facilities for operator.

8) Undertake Pre-System Sanitation Survey to Document Existing Conditions

The purpose of this survey is to have an historical record of the existing conditions, public usage, and costs of the present disposal system. The survey will entail the following tasks:

a) On-site surveys: With the aid of the Center for Community Development at Humboldt State (a Federally sponsored program to explore, study, and initiate community activities to improve their environment), an in-depth survey of existing conditions at the six disposal sites is planned. This survey will measure:

(1) Present disposal rates -- based on estimated volumes, numbers of cans, etc.

(2) Sanitation level in and around dump site -- i.e., litter, odor, vectors, flies, etc.

(3) General area-wide level of sanitation -- i.e., litter along roadside, indiscriminate dumping, etc.

(4) Public acceptance -- On-site interviews with public utilizing dumps, requesting resident's appraisal of present system and thoughts on a containerized system.

(5) Public usage -- Vehicle counters will be placed at dump sites to record total number of vehicles utilizing sites per week. On-site surveys will establish types of vehicles utilizing sites (i.e., cars, pick-ups, trailers, etc.).

(6) Provide a photographic record of existing conditions.

b) Questionnaires: Questionnaires will be mailed to local residents detailing nature of project, expected results, sources of revenue and requesting resident's reaction. Questionnaires will be prepared with the advice and guidance of a specialist in this field, Mr. Evan Peters, Public Relations Consultant.

c) Cost analysis: A detailed cost analysis will be made by County personnel to establish the total cost of the existing system. This will include all direct and indirect costs such as site maintenance, equipment and land acquisitions, County Health personnel assigned to monitoring sites, County road maintenance personnel, State fire crews' time spent on putting out numerous dump fires, and associated preventive maintenance costs, etc. The County will establish accurate record keeping procedures to allow for comparison of indirect personnel costs before and after installation of the containerized refuse collection and disposal system.

9) Advertise for Bids, Award Contracts, and Supervise Construction of Container Sites and Appurtenances at the Sanitary Landfill Site

The primary effort in this task will be devoted to insuring the completion of all construction within the delegated time period. However, an important part of our effort will be devoted to documenting the construction schedules planned versus those achieved, labor costs, material costs, and County supervisory costs. In addition, an effort will be made to separate the cost figures for the two types of container sites.

10) Select and Purchase Necessary Equipment

The equipment to be purchased will include the containers, collection vehicle, washing system, right angle pick-up device, truck scale, crawler tractor, and site maintenance and clean-up tools. The primary effort here will be to secure the delivery of the equipment in accordance with our pre-established time schedule.

11) Establish Data Retrieval Systems

The objective of this task is to detail and formulate the data sheets and formal records that are to be maintained throughout the course of the project. Such records will include:

a) Daily trip records, including estimated volumes, travel times, mileage, clean-up time at container site due to spillage, loading times, washing times, and daily comments on appearance of container sites.

b) Weight records of incoming refuse at the landfill.

c) All related cost data, including labor, equipment repairs, equipment maintenance, fuel, tires, container repairs and maintenance, and all miscellaneous expenditures.

d) Notes of all unusual occurrences, including accidents, fires, mechanical breakdowns, etc.

12) Operate Demonstration System for Trial Period

The purpose of this task is to provide for staffing and adequate training of personnel, familiarization of landfill operator and collection vehicle operator with suggested operational procedures and record maintenance procedures, and "debugging", modification, and maximization of the following tasks:

a) Vehicle schedules and routes.

b) Pick-up procedures.

c) Unloading procedures.

d) Container site clean-up procedures.

e) Maintenance procedures.

13) Eliminate Dumps

The elimination of the present dump sites will entail site clean-up, a vector eradication program, selection of final contours, placement of cover material, and planting. It might be noted that the dumps will not be eliminated until the containerized collection and disposal system is in operation. The costs have been based on the availability of equipment at the site and their relative size.

14) Conduct Test Program

As previously outlined, the basic test program is divided into two distinct nine-month periods during which operational data will be gathered. The obvious benefit of such a test program is that we will be able to obtain two sets of operational data for each container site (one based on the 8 cubic yard system and the other based on the 40 cubic yard system, both with and without lids). The data obtained during these periods will include the daily trip records, weight records, and all related operational cost data, including records of vandalism, salvaging, and associated nuisances.

In addition, a number of special studies will be conducted during the course of the project. These include:

a) Periodic on-site surveys: As in tasks 8) a), these surveys will be conducted with the aid of the Center for Community Development, and will include records of disposal rates, sanitation, public acceptance, public usage, types and quantity of waste material too large to be serviced by the 8 cubic yard containers, reduction in land and air pollution, and photographs.

b) Fly larvae study: The objective of this study is to determine whether or not there is a significant difference in fly production from the two types of containers; what effect the refuse collection schedules will have on such fly production, and a measure of the fly production problem as compared to the urban domestic waste fly problem. These tests will be conducted by the State Department of Public Health, Bureau of Vector Control.

c) Fumigation tests: The purpose of this test is to determine the necessity of fumigating the bins, and if found necessary, techniques or methods that can be utilized at the container sites. (One suggestion is simply throwing in a fumigation bomb and closing the lids.)

d) Effluent study: The function of this test is to sample and evaluate the quality and quantity of the effluent from the container during wet weather so that appropriate solutions can be recommended, if the problems warrant a remedy.

e) Feasibility of a combined system: This test is intended to evaluate the practical and economic feasibility of utilizing a container system incorporating both the 8 and 40 cubic yard containers. Two low capacity sites (Benbow -- 5 to 10 cubic yards per week, and Shelter Cove -- 16 cubic yards per week) and two high capacity sites will be selected and operated for some time duration (2 to 3 months) with a combined system. As an example, one site may be operated with both containers present but requesting the users to dump the garbage and compactible refuse in the 8 cubic yard container thus allowing for weekly collection of the 8 cubic yard bin and perhaps monthly of the 40 cubic yard container; or the residents may be informed that bulky items must be brought to the site only during specific periods when a large bin has been provided for their disposal. In either case, the systems will be evaluated with regard to costs, public acceptance, site spillage, clean-up times, etc.

f) Collection frequency studies: The objective of this task is to ascertain the influence of collection frequency on site spillage, and to determine the optimum frequency, taking into account total costs. The frequency will be varied from twice a week to twice a month.

g) Fire study: The objective of this study is to determine the feasibility of smothering a fire set in a bin by simply closing its lid. Since a fire will not necessarily start when someone is there to close the lid, alternate fire prevention devices may be tried, i.e., small fire extinguishers with heat sensitive controls, etc.

h) User acceptance surveys: Questionnaires will be mailed at the conclusion of the project requesting the local residents to comment on their reaction to the new system.

i) Alternate use concept studies: The objective of this aspect of the study is to define, evaluate, and demonstrate the number and types of alternate uses for the collection vehicle, (i.e., snow removal, general hauling, brush collection, etc.). The off-on truck and compaction body type will be evaluated separately and as a combined piece of equipment.

15) Collate and Graphically Present All Data Generated Throughout the Life of the Project

The prime function of this task is to assemble and summarize the engineering data and related findings in a clear and concise manner that will enable other interested solid waste technical personnel to analyze the raw data and draw their own conclusions. No attempt will be made to evaluate the data nor apply our locally slanted standards. It is hoped that such an approach will provide other communities having different standards, economic bases, and values, to select the system that best fits their needs.

16) Investigate Alternate Management Systems, Sources of Revenues, and Methods of Financing the Containerized Collection and Disposal System for Implementation Throughout the County

The purpose of this task is to develop a management system and financing plan that is uniquely suited for a rural cost minded County such as Humboldt, and can, with little or no modification, be adapted to other counties similarly situated. The various financing vehicles that are applicable will be considered and evaluated, including the non-profit corporation, special district, County service areas, and the existing County agencies. The merits and limitations of these financing vehicles will be compared and weighed with particular emphasis on distributing the costs of the capital expenditures among present and future users, and on the relationship of costs and benefits, since the benefits to be derived may not be County-wide nor evenly distributed. The valid sources of funds for operational and capital expenses that are available to rural areas, but heretofore have not been utilized or applied to a project of this nature, will be reviewed and evaluated, and enabling steps will be formulated where applicable. Such funds may include, but are not limited to, County Local Service Area Taxes, Health and Sanitation Department Revenues, State Park Disposal Charges, Franchise Payments, County

Maintenance Funds and County Property Acquisition Funds. In devising such a broadly-based plan for tapping these sources, consideration will be given to the following:

a) Developing revenue sources which are adequate, equitable, and stable;

b) Investigating the nature and extent of reductions in existing programs that might be applied as offsets to project costs such as road maintenance;

c) Relating revenue sources as closely as possible to the activities that are associated with the generation of solid wastes and their improper or inadequate disposal;

d) Identifying the major beneficiaries of the program as possible sources of income or in-kind contributions;

e) Involving as many different levels and kinds of governmental agencies as possible to develop a widespread interest, concern, and responsibility for solving the problem of solid waste disposal in the most economical manner;

f) Establishing financial record-keeping procedures that will facilitate a program budgeting approach to allocating funds for solid waste disposal; and

g) Considering and evaluating alternative financing plans to arrive at the most practical and appropriate combination of revenue sources, recognizing that solid waste disposal is emerging as a public responsibility that cannot be solved on community level.

The final plan will include projections of revenues with growth at varying levels of charges, benefit cost relationships, and specific recommendations detailing the sources of funds for operating Area 1 beyond the end of the demonstration project and for capitalizing the containerized system for implementation throughout Humboldt County.

17) Evaluate Containerized Storage, Collection, and Disposal System

The objective of this task is to review and analyze the comparative engineering data relating to the operational and functional characteristics of the sub-systems (collection vehicles, container sites, and containers) by themselves, and as components of the integrated storage, collection, and disposal system. Sub-systems will be evaluated with regard to:

a) Public usage.

b) Public preferences with emphasis on the socio-psychological effects on the local populace, including attempts to quantify these "human" factors. A sociologist from Humboldt State College will have major input in this part of the evaluation.

c) Operational and capital costs.

d) The influence of selected types of refuse on the two types of containers.

e) The effectiveness of the facilities in reducing environmental pollution, including reduction in air, water, and land pollution. The Humboldt County Air Pollution Control District will be requested to evaluate the benefits attributed to a reduction in air pollution.

f) The advantages or disadvantages of the two types of site configurations and related savings, if any, in site clean-up and maintenance.

g) The effectiveness of the container lids in reducing site spillage and related savings in operational costs.

h) The flexibility of the two alternate container sizes in meeting unusual or peak loads.

i) The fly production or other vector problems from the bins.

j) The optimum frequency of container pick-up as determined by minimum operational and site clean-up costs.

k) The adaptability of the collection vehicles to alternate uses, and the application of an appropriate dollar value to such use.

l) The economic feasibility of operating a combined system.

m) The effect of the so-called "non-engineering" factors, (fire hazards, aesthetics, tourism, litter, public morale, etc.).

n) The quality of the effluent from the containers during wet weather.

o) The efficiency, usefulness, and costs of a truck mounted wash system.

p) Any marked increase in per capita production after installation of the system.

q) The influence of the containerized storage, collection, and disposal system in reducing County, State, and municipal personnel costs associated with refuse management (road department, health department, State Division of Forestry, etc.).

r) Any change in maintenance costs due to vandalism.

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18) Modify System and Integrate with General County Plan

The purpose of this task is to select the best system or combination of systems for implementation in the remaining rural areas of Humboldt County. The selection will be based on the comparative engineering and related data generated during the demonstration project, and on those constraints that are native to the County of Humboldt. Although the results of this task pertain directly to Humboldt County, it is anticipated that the analytical tools utilized in their selection will be made available to other counties and enable them to apply their constraints to the same data for selection of the system most applicable to their own region.

19) Dissemination of Results

The objective of this task is to make available the results of the demonstration program to all regional solid waste management personnel, sanitarians, County and public officals, or any interested parties as soon as any definitive or useful information or data is obtained. It is our opinion that because of the wide-spread interest in the containerized storage, collection, and disposal system, and the dire need for immediate workable alternates to the rural areas' waste disposal problems, the demonstration project should include a vehicle for rapid and effective means of disseminating the generated information prior to publication of the final report some 3 years hence. For this reason, we are planning a series of short, one-day seminars to be held periodically throughout the course of the project. These seminars will include presentation of the raw data, discussion of conclusions to date, a tour of the facilities, and a demonstration of the equipment. It is envisioned that these seminars will be presented by the members of the Project and Technical Advisory Committees with the sponsorship of all participating agencies. It is also anticipated that brochures will be prepared and distributed to the newspapers and television stations for informative articles. They would also be sent to the various service groups such as the chambers of commerce, local P. T. A., and grange halls so that discussions could be scheduled.

20) Documentation of Results

This task involves the preparation of formal written report incorporating all the data, information, and conclusions of the previous tasks. Due to the nature of the project and the need for annual progress reports, our present plans call for the final report to consist of three separate and publishable reports, one at the end of each project year. These reports will be in place of the annual progress reports. In addition, quarterly progress reports will be prepared for the benefit of the Advisory Committee and the Public Health Service.

Task Responsibility by Participating Agencies

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
1	Administrative agent, including responsibility for coordinating and arranging for meetings	Responsible for presentation of design, plans and progress reports to Project Advisory Committee	Advisory role	Project Advisory Committee Member	
2	Technical Advisory Committee Member	Administrative agent, including responsibility for arranging meetings and presentation of test program	Technical Advisory Committee Member	Technical Advisory Committee Member	Technical Advisory Committee Member
3	Advisory role	Prime responsibility for defining and delineating test programs	Advisory role	Advisory role	Guidance on design of test procedures
4	Administrative agent and prime responsibility for dissemination of information	Provide County with data and basic information to be released to public	Guidance on techniques involved in conducting a successful public information program	Advisory role	

Table 1
Continued

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
5	Prime responsibility for selecting, negotiating and purchasing of container sites & central landfill site	Technical guidance on site suitability		Guidance on site selection	
6					
A	Provide site surveys and design of access roads	Investigation of alternate construction materials and design of facilities			Check drawings and review design
B	Provide guidance on County's purchasing techniques and any specific County requirements	Select number and type of containers and write purchasing specifications			Review container specifications
C	Provide guidance on County's purchasing techniques and any specific County requirements	Select standard equipment or design special unit and integrate with collection equipment			Review equipment specifications

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Table 1
Continued

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
D	Select chassis based on terrain or other specific County requirements	Integrate chassis with Dinosaur understructure, compaction body, wash system and right-angle pick-up			Review equipment specifications
E	Specify facility requirements	Design structure including construction drawings and specifications			Review construction drawings
7	Provide site surveys, initial topographic maps, design of access roads, ultimate use concepts, soil tests and contract for well	Investigation of soil and ground water characteristics, selection of final ground contours based on ultimate use concepts, recommendation of landfilling procedure and design of appurtenances, including drainage facilities, fencing, utilities, scale, & facilities for operator		Guidance on ultimate use concepts and landfill procedures	Check drawings and review design

Table 1
Continued

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
8					
A	Provide coordination with Center for Community Development, and supervision of field surveys	Responsible agent for task, including direct supervision of initial field surveys and statistical analysis of data	Primary responsibility in designing survey form and insuring validity of samples	Guidance on survey forms and sampling and participation in sanitation surveys	Review survey forms and sampling techniques
B	Provide master lists of residents in demonstration area and distribution of questionnaire	Responsible agent for task including design of questionnaire, and processing of data	Technical assistance in designing questionnaires		
C	Responsible for maintenance and continual accumulation of all relevant cost data pertaining to the existing and proposed refuse management systems	Provide over-all coordination, design of information retrieval systems, and evaluation of data			
9	Prime responsibility for completion of task, including maintenance of accurate cost records	Provide documentation of construction program and insure reliability of cost data			

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Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
14 Basic Test Program	Prime responsibility for general operation of demonstration system, including routine operational controls and maintenance of record keeping procedures	Responsible for overall coordination of various field studies and operational procedures, continual evaluation of data to guide test programs, and technical guidance			Technical guidance on all test procedures
A	See 8 A	See 8 A			
B	Responsible for integration of tests into daily routine operation	Provide coordination and documentation of test programs		Prime responsibility for conduct of tests	
C	See above	Provide coordination and documentation of test programs		See above	
D E F G	Responsible for integration of tests into daily routine	Prime responsibility for conduct of test		Guide and review test programs	Review

Table 1
Continued

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
10	Prime responsibility for ordering and purchasing of all equipment	Insure that all equipment is purchased and delivered according to project schedule			
11	Provide actual implementation and maintenance of data retrieval systems	Prime responsibility for establishing record keeping procedure including design and continual surveillance			
12	Responsible for training crew on operational and record keeping procedures and field supervision	Responsible for debugging and alteration of procedures and schedules to maximize efficiency of crews, and for general surveillance			
13	Prime responsibility for site clean-up, vector eradication, and final cover	Provide documentation of site clean-up procedure			

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
H	See 8 B	See 8 B			
I	See 14 D	See 14 D			
15	Assemble raw data	Prime responsibility for collating and summarizing all engineering and cost data			Review collation procedures and insure adequate statistical controls
16	Aid in development of most applicable revenue sources	Provide basic cost data and related information	Prime responsibility for task		
17	Provide input with regard to operational experience	Prime responsibility for evaluation of systems		Technical guidance	Review evaluation procedures
18	Provide input with regard to operational preference and local constraints	Prime responsibility for development of system constraints, analytical tools and final recommendations	Provide input with regard to financial consideration	Technical guidance	

Table 1
Continued

Task No.	Humboldt County	G·E·K·R	Bartle Wells Associates	State of California Dept. of Public Health	Public Health Service
19	Administrative agent with regard to time, place, arrangement for tours and demonstration of equipment, and related details	Program planning and participant in presentation of material	Program planning and participant in presentation of material	Program planning and participant in presentation of material	Program planning and participant in presentation of material
20	Aid in the preparation of progress and final reports	Prime responsibility for task	Contributor	Technical guidance	Review capacity

Table 2

Project Staffing Requirements By Tasks

Task	Title	Man-Days By Year 1	2	3	Total	Percent of Total
1	Reconvene Project Advisory Committee	26	13	9	45	4.0
2	Establish Technical Advisory Committee	27	16	12	55	4.8
3	Detail Testing Program	7	3	3	13	1.3
4	Commence Public Information Program	13	9	8	30	2.7
5	Site Acquisition and Right-of-Way Negotiations	34	-	-	34	3.0
6	Develop Final Plans and Specifications for the Containerized Storage and Collection System	82	-	-	82	7.2
7	Develop Final Plans and Specifications for Centrally Located Sanitary Landfill	63	-	-	63	5.5
8	Undertake Pre-System Sanitation Survey to Document Existing Conditions	36	6	6	48	4.3
9	Advertise for Bids, Award Contracts, and Supervise Construction of Container Sites and Appurtenances at the Sanitary Landfill Site	85	87	-	172	15.1
10	Select and Purchase Necessary Equipment	7	6	-	13	1.2

Table 2
Continued

Task	Title	Man-Days By Year 1	2	3	Total	Percent of Total
11	Establish Data Retrieval Systems	7	-	-	7	.1
12	Operate Demonstration System for Trial Period	-	30	-	30	2.7
13	Eliminate Dumps	-	15	-	15	1.4
14	Conduct Test Program	-	55	149	204	18.0
15	Collate and Graphically Present All Data Generated Throughout the Life of the Project	10	16	21	47	4.2
16	Investigate Alternate Management Systems, Sources of Revenue and Methods of Financing the Containerized Collection and Disposal System for Implementation Throughout the County	10	10	20	40	3.5
17	Evaluate Containerized Storage, Collection, and Disposal System	13	13	20	46	4.1
18	Modify System and Integrate with General County Plan	-	-	22	22	1.9
19	Dissemination of Results	-	21	21	42	3.7
20	Documentation of Results	33	43	53	129	11.3
					1,137	100.0

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EXHIBIT 4
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APPENDIX B
EXHIBIT 5

RURAL AREA CONTAINERIZED COLLECTION SYSTEM

12/30/70

ROUTE SCHEDULE - A

Day	Point of Departure	Destination	Distance * (Miles)	Travel Time (Minutes)	Container Site Maintenance Time (Minutes)	Dumping and Truck Maintenance Time (Minutes)	Record Keeping Time (Minutes)
Monday (8 cu. yd.)	Garberville	Petrolia	46	125	30	100**	10
	Petrolia	Thorn	40	117	30	-	10
	Thorn	Garberville	20	43	-	15	-
			106	285	60	115	20
					480		
Tuesday (40 cu. yd.)	Garberville	Alderpoint	30	70	30	15	10
	Garberville	Fruitland	50	70	30	40	10
			80	140	60	55	20
					275		
Wednesday (40 cu. yd.)	Garberville	Blocksburg	54	140	30	30	10
					210		
Thursday (8 cu. yd.)	Garberville	Petrolia	46	125	30	-	10
	Petrolia	Shelter Cove	45	135	30	-	10
	Shelter Cove	Thorn	15	42	30	-	10
	Thorn	Garberville	20	43	-	15	-
			126	345	90	15	30
					480		
Friday (40 cu. yd.)	Garberville	Alderpoint	30	70	30	30	10
	Garberville	Fruitland	50	70	30	15	10
	Garberville	Blocksburg	54	140	30	15	30***
			134	280	90	60	50
					480		

* one-way (8) and two-way (40)
** weekly truck maintenance
*** includes weekly record maintenance

APPENDIX B
EXHIBIT 6

12/30/70

RURAL AREA CONTAINERIZED COLLECTION SYSTEM

ROUTE SCHEDULE - A[1]

Day	Point of Departure	Destination	Distance * (Miles)	Travel Time (Minutes)	Container Site Maintenance Time (Minutes)	Dumping and Truck Maintenance Time (Minutes)	Record Keeping Time (Minutes)
Monday (40 cu. yd.)	Garberville	Thorn	40	85	30	15	10
	Garberville	Petrolia	92	250	30	40	10
			132	335	60	55	20
					480		
Tuesday (8 cu. yd.)	Garberville	Alderpoint	15	35	30	-	10
	Alderpoint	Blocksburg	12	35	30	-	10
	Blocksburg	Fruitland	52	105	30	-	10
	Fruitland	Garberville	25	85	-	30	-
			104	210	90	30	30
					360		
Wednesday (40 cu. yd.)	Garberville	Shelter Cove	50	130	30	30	10
					205		
Thursday (40 cu. yd.)	Garberville	Thorn	40	85	30	15	10
	Garberville	Petrolia	92	250	30	40	10
			132	335	60	55	20
					480		
Friday (8 cu. yd.)	Garberville	Alderpoint	15	35	30	-	10
	Alderpoint	Blocksburg	12	35	30	-	10
	Blocksburg	Fruitland	52	105	30	-	10
	Fruitland	Garberville	25	85	-	130*	20**
			104	210	90	130	50
					480		

*one-way (8) and two-way (40)
**includes weekly truck maintenance
***weekly record maintenance

APPENDIX B
EXHIBIT 7

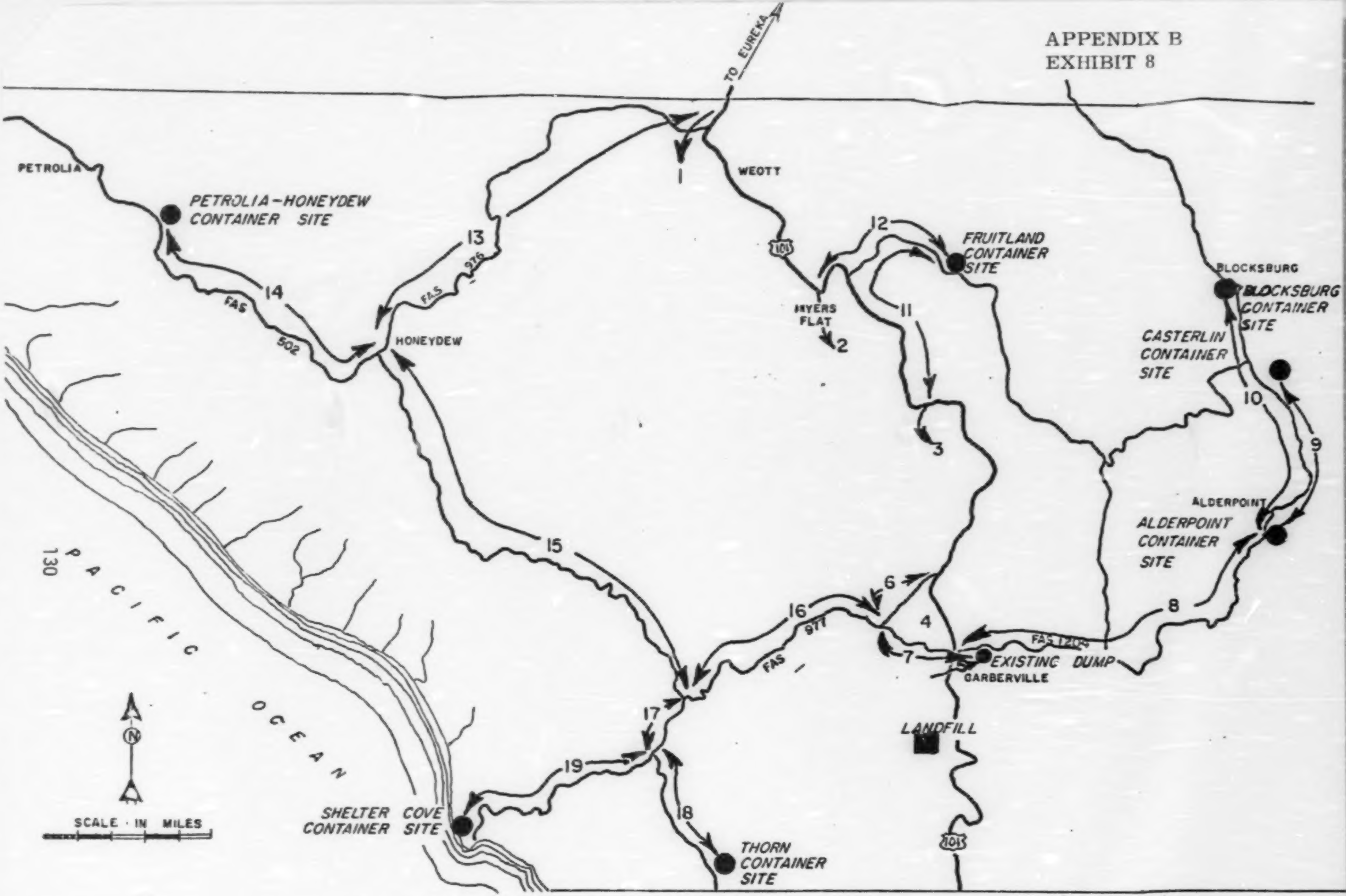
12/30/70

RURAL AREA CONTAINERIZED COLLECTION SYSTEM

ROUTE SCHEDULE - SUMMARY

Route Schedule	System	Collection Area	Total Distance (Miles)	Total Travel Time (Minutes)	Total Container Site Maintenance Time (Minutes)	Total Dumping and Truck Maintenance Time (Minutes)	Total Record Keeping Time (Minutes)
A	8 cu. yd.	Thorn, Shelter Cove and Petrolia	232	630	150	130	50
				780		180	
					960		
A	40 cu. yd.	Alderpoint, Blocksburg and Fruitland	268	560	180	145	80
				740		225	
					965		
A^1	8 cu. yd.	Alderpoint, Blocksburg and Fruitland	208	420	180	160	80
				600		240	
					840		
A^1	40 cu. yd.	Thorn, Shelter Cove and Petrolia	314	800	150	140	50
				950		190	
					1,140		
A & A^1	8 cu. yd.	Thorn, Shelter Cove, Petrolia, Alderpoint, Blocksburg and Fruitland	440	1,050	330	290	130
				1,380		420	
					1,800		
A & A^1	40 cu. yd.	Thorn, Shelter Cove, Petrolia, Alderpoint, Blocksburg and Fruitland	584	1,360	330	285	130
				1,690		415	
					2,105		

APPENDIX B
EXHIBIT 8


TO EUREKA
PETROLIA
PETROLIA-HONEYDEW CONTAINER SITE
WEOTT
1
12
FRUITLAND CONTAINER SITE
101
BLOCKSBURG
BLOCKSBURG CONTAINER SITE
13
FAS 976
14
FAS 502
HONEYDEW
MYERS FLAT
2
11
CASTERLIN CONTAINER SITE
10
9
3
ALDERPOINT
ALDERPOINT CONTAINER SITE
15
PACIFIC OCEAN
6
16
FAS 977
4
8
FAS 1204
7
5
EXISTING DUMP
GARBERVILLE
LANDFILL
17
N
19
18
SCALE · IN MILES
SHELTER COVE CONTAINER SITE
THORN CONTAINER SITE
101

Travel Time Map

Numbers record time in minutes

APPENDIX B
EXHIBIT 9

RURAL AREA CONTAINERIZED COLLECTION SYSTEM

WORK SCHEDULE - A

Day	Personnel	Daily Work Schedule 8 9 10 11 12 1 2 3 4 5	Collection Operations (Hours)	Disposal Operations (Hours)	Total Work Hours Per Operator
Monday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	——————————		4	4
	A	———————————		4	4
Tuesday	PO	XXXXXXXXXXXXXXXXXXXXXX——————————	4-1/2	3-1/2	8
	SO				
	A	———————————		4	4
Wednesday	PO	XXXXXXXXXXXXXXXXXXX———————————	3-1/2	4-1/2	8
	SO				
	A	———————————		4	4
Thursday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	——————————		4	4
	A	———————————		4	4
Friday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	——————————		4	4
	A	————————————		4	4
		Weekly Total — Primary Operator (PO)	32	8	40
		Secondary Operator (SO)		12	12
		Attendant (A)		20	20
		Total Weekly Work Hours Per Operation	32	40	
		Total Weekly Work Hours	72		

XXX Primary operator
—— Secondary operator

APPENDIX B
EXHIBIT 10

RURAL AREA CONTAINERIZED COLLECTION SYSTEM

WORK SCHEDULE - A[1]

Day	Personnel	Daily Work Schedule 8 9 10 11 12 1 2 3 4 5	Collection Operations (Hours)	Disposal Operations (Hours)	Total Work Hours Per Operator
Monday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	____________		4	4
	A	______________		4	4
Tuesday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXX______	6	2	8
	SO				-
	A	__________________		5	5
Wednesday	PO	XXXXXXXXXXXXXXXX________________	3-1/2	4-1/2	8
	SO				-
	A	________		3	3
Thursday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	____________		4	4
	A	_____________		4	4
Friday	PO	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	8		8
	SO	____________		4	4
	A	_____________		4	4
		Weekly Total Primary Operator (PO)	33-1/2	6-1/2	40
		Secondary Operator (SO)		12	12
		Attendant (A)		20	20
		Total Weekly Work Hours Per Operation	33-1/2	38-1/2	
		Total Weekly Work Hours	72		

XXXX Primary Operator
____ Secondary Operator

APPENDIX C
EXHIBIT 11
Page 1 of 2

CRITERIA OF THE

PROPOSED SANITARY LANDFILL

for the

GARBERVILLE REDWAY AREA

The Department of Public Works has been attempting to locate a suitable parcel of land for the central sanitary landfill in the Garberville-Redway area for the Solid Waste Demonstration Project.

The Central Landfill will be operated by County personnel for the first three years, and franchise operation may be evaluated for future operation of the landfill.

The sanitary landfill, regardless of the "type" of operation, will be administered by the County of Humboldt, and the following requirements have been established:

I. Site Selection and Design

A. Site Location.

1. Aesthetics of the area - view from existing roads - suitable landscaping and fencing will be developed for the perimeter and entrance areas.

2. Development to serve as a land reclamation project. (Evaluation of existing and possible land utilization.)

3. Canyon areas are suitable if stream and/or surface waters can be diverted and the perimeter fill slopes are no greater than 4:1.

B. Site Design.

1. The design will be based upon geological and soil investigations to insure fill stability and to prevent ground water or subsurface water pollution.

2. A consultant knowledgeable in landfill design will be utilized; the plans will be reviewed and approved by the County, the Water Quality Control Board, the State of California Public Health Service, and the U. S. Environmental Protection Agency's Solid Waste Management Office.

APPENDIX C
EXHIBIT 11
Page 2 of 2

C. Site Facilities.

1. Maintenance building and a yard area.

2. Access road and possibly a bin area for all smaller loads delivered by public.

3. If necessary, portable "wind cages" to prevent papers from blowing around on the site.

D. Site Operation.

1. A dozer will be operated at the site at all times, covering wastes at least once a day (all wastes will be covered at the end of each day's operation).

2. Private franchise trucks and a County bin truck will return to the site at varied hours with waste material.

3. The general public will utilize the site seven (7) days per week.

E. Alternate Land Use.

1. Evaluation of possible recreational or other usage, including grazing, on areas of the site not currently being landfilled.

2. Master Plan of ultimate use concepts for landfill site.

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II

APPENDIX D
EXHIBIT 12
Page 1 of 7

SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Alderpoint	4/2/71 (Friday) thru 4/4/71 (Sunday)	31

Vehicle Arrival Time (35)
Range 10:00AM-4:00PM Mode 11:00AM-12:00PM

Unloading Time (36 - 35)
Range 1 - 25 minutes Mean 7.3 minutes Mode Less than 1 minute

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	8	8	-	-
Station Wagon	1	1	-	-
Trailer	-	-	-	-
Pick-Up or Light Van	17	14	1	2
Heavy Truck	3	3	-	-
Refuse Vehicle	-	-	-	-
Other School Bus	1			1
Motorcycle	1	1		

Vehicle Driver Summary

Age Distribution (40)

	Total	16 - 35	36 - 55	55+
M	25	12	7	6
F	6	3	2	1

Vehicle Passengers/Helpers Summary

Age Distribution (42)

	Total	0 - 9	10 - 15	16 - 35	36 - 55	55+
M	24	6	9	7	1	1
F	9	5	-	3	1	-

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	6	-	55	45	-
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	6	-	100	-	-
Medium (24" x 24" x 24")	-	-	-	-	-
Large (36" x 36" x 36")	-	-	-	-	-
Steel/Plastic Containers					
20 Gal. or Less	12	50	50	-	-
30 Gal.	9	50	50	-	-
50 Gal.	6	40	60	-	-
Sacks	3	35	65	-	-
Other					

Miscellaneous Wastes Summary (49)
Scrap metal - pick up load
Litter - from school bus and motorcycle
Ten empty boxes
Magazines

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)
Total 4.5 Per Vehicle 0.15

Unloading Procedures Reported (51)	
Direct From Vehicle	10
Lift and Carry	21
Drag or Push on Ground	1
Other	

Final Disposition Summary (52)	
On Edge	5
Into Pit	27
Elsewhere on Premises	
Other	

Salvaging Practices Observed (53)
One individual salvaging
copper - recovers
approximately $100/year

Remarks (54) One car with three people stopped to chat.

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II

APPENDIX D
EXHIBIT 12
Page 2 of 7

SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Blocksburg	4/2/71 (Friday) thru 4/4/71 (Sunday)	9

Vehicle Arrival Time (35)
Range 10:30AM-3:30PM Mode 3:00PM-4:00PM

Unloading Time (36 - 35)
Range 1 - 16 minutes Mean 5.8 minutes Mode 5 - 7 minutes

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	1	1	-	-
Station Wagon	-	-	-	-
Trailer	-	-	-	-
Pick-Up or Light Van	8	8	-	-
Heavy Truck	-	-	-	-
Refuse Vehicle	-	-	-	-
Other				

Vehicle Driver Summary

Age Distribution (40)

	Total	16 - 35	36 - 55	55+
M	6	2	4	-
F	3	1	2	-

Vehicle Passengers/Helpers Summary

Age Distribution (42)

	Total	0 - 9	10 - 15	16 - 35	36 - 55	55+
M	2	-	-	1	1	-
F	2	-	-	1	1	-

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	4	10	40	50	
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	3	-	65	35	-
Medium (24" x 24" x 24")	4	35	50	15	-
Large (36" x 36" x 36")	-	-	-	-	-
Steel/Plastic Containers					
20 Gal. or Less	2	25	50	25	-
30 Gal.	3	100	-	-	-
50 Gal.	-	-	-	-	-
Sacks	2	50	50	-	-
Other	-	-	-	-	-

Miscellaneous Wastes Summary (49)

Litter - from passing vehicles
Timber and construction debris

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)

Total 2.0 Per Vehicle 0.2

Unloading Procedures Reported (51)	
Direct From Vehicle	4
Lift and Carry	7
Drag or Push on Ground	-
Other	-

Final Disposition Summary (52)	
On Edge	1
Into Pit	10
Elsewhere on Premises	-
Other	-

Salvaging Practices Observed (53)
None

Remarks (54)

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II

APPENDIX D
EXHIBIT 12
Page 3 of 7

SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Fruitland	4/2/71 (Friday) thru 4/4/71 (Sunday)	20

Vehicle Arrival Time (35)
Range 9:30AM-4:00PM Mode 11:00AM-12:00PM

Unloading Time (36 - 35)
Range 2 - 30 minutes Mean 9.8 minutes Mode 3 - 5 minutes

Vehicle Analysis

Type	Total (37)	Public	Commercial	Gov't.
		Ownership Distribution (38)		
Sedan	2	2	-	-
Station Wagon	-	-	-	-
Trailer	1	1	-	-
Pick-Up or Light Van	17	17	-	-
Heavy Truck	1	-	1	-
Refuse Vehicle	-	-	-	-
Other				

Vehicle Driver Summary

Age Distribution (40)

	Total	16 - 35	36 - 55	55+
M	18	10	7	1
F	2	2	-	-

Vehicle Passengers/Helpers Summary

Age Distribution (42)

	Total	0 - 9	10 - 15	16 - 35	36 - 55	55+
M	11	5	4	2	-	-
F	7	2	-	4	1	-

Household Wastes Analysis

Type of Containers (43)	Total (44)	Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
		Type of Waste Observed (%)			
Loose	5	20	45	35	-
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	-	-	-	-	-
Medium (24" x 24" x 24")	3	50	50	-	-
Large (36" x 36" x 36")	-	-	-	-	-
Steel/Plastic Containers					
20 Gal. or Less	3	50	50	-	-
30 Gal.	3	50	50	-	-
50 Gal.	7	35	50	(---15	---)
Sacks	11	70	30	-	-
Other					

Miscellaneous Wastes Summary (49)
Dead sheep (1)
Miscellaneous steel items (refrigerator, stove, heater) - pick up load

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)
Total 4.0 Per Vehicle 0.2

Unloading Procedures Reported (51)	
Direct From Vehicle	19
Lift and Carry	2
Drag or Push on Ground	-
Other	-

Final Disposition Summary (52)	
On Edge	-
Into Pit	21
Elsewhere on Premises	-
Other	-

Salvaging Practices Observed (53)
Two individuals reported salvage on regular basis

Remarks (54)

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II

APPENDIX D
EXHIBIT 12
Page 4 of 7

SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Petrolia-Honeydew	4/2/71 (Friday) thru 4/4/71 (Sunday)	12

Vehicle Arrival Time (35)
Range 10:30AM-4:15PM Mode 11:00AM-12:00PM

Unloading Time (36 - 35)
Range 1 - 7 minutes Mean 4.6 minutes Mode 5 - 7 minutes

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	5	5	-	-
Station Wagon	1	1	-	-
Trailer	-	-	-	-
Pick-Up or Light Van	6	6	-	-
Heavy Truck	-	-	-	-
Refuse Vehicle	-	-	-	-
Other				

Vehicle Driver Summary

	Total	Age Distribution (40) 16 - 35	36 - 55	55+
M	6	2	4	-
F	6	2	4	-

Vehicle Passengers/Helpers Summary

	Total	Age Distribution (42) 0 - 9	10 - 15	16 - 35	36 - 55	55+
M	7	-	2	5	-	-
F	11	4	3	2	2	-

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	5	30	40	30	
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	9	60	40	-	-
Medium (24" x 24" x 24")	6	50	50	-	-
Large (36" x 36" x 36")	-	-	-	-	-
Steel/Plastic Containers					
20 Gal. or Less	2	25	75	-	-
30 Gal.	1	(-----------	-----100	---------	-)
50 Gal.	-	-	-	-	-
Sacks	17	45	55	-	-
Other					

Miscellaneous Wastes Summary (49)
Miscellaneous items - pick up load
Television set (1)
Sofa couch (1)

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)
Total 3.5 Per Vehicle 0.3

Unloading Procedures Reported (51)	
Direct From Vehicle	2
Lift and Carry	11
Drag or Push on Ground	-
Other	-

Final Disposition Summary (52)	
On Edge	1
Into Pit	12
Elsewhere on Premises	-
Other	-

Salvaging Practices Observed (53)
Two individuals salvaging
wood and scrap metal

Remarks (54) Reported that children play in dump while parents unload.

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II
APPENDIX D
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S U M M A R Y

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Thorn	4/2/71 (Friday) thru 4/4/71 (Sunday)	20

Vehicle Arrival Time (35)
Range ------ *1 Mode ------ *1

Unloading Time (36 - 35)
Range ------ *1 Mean ------ *1 Mode ------ *1

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	4	3	1	-
Station Wagon	3	2	-	-
Trailer	-	-	-	-
Pick-Up or Light Van	13	10	-	-
Heavy Truck	-	-	-	-
Refuse Vehicle	-	-	-	-
Other				

Vehicle Driver Summary

Age Distribution (40)

	Total	16 - 35	36 - 55	55+
M	15	10	4	1
F	5	5	-	-

Vehicle Passengers/Helpers Summary

Age Distribution (42)

	Total	0 - 9	10 - 15	16 - 35	36 - 55	55+
M	21	9	1	8	2	1
F	9	2	2	4	-	1

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	2	45	45	10	-
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	19	75	25	-	-
Medium (24" x 24" x 24")	4	50	50	-	-
Large (36" x 36" x 36")	13	55	40	(---5---)	
Steel/Plastic Containers					
20 Gal. or Less	13	100	-	-	-
30 Gal.	3	100	-	-	-
50 Gal.	1	100	-	-	-
Sacks	13	95	5		
Other					

Miscellaneous Wastes Summary (49)

Dead cats (2) and calves (2)
Miscellaneous household items - pick up load
Miscellaneous bulky items - pick up load
Miscellaneous debris - pick up load

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)

Total 17.5 Per Vehicle 0.9

Unloading Procedures Reported (51)	
Direct From Vehicle	15
Lift and Carry	5
Drag or Push on Ground	1
Other	-

Final Disposition Summary (52)	
On Edge	-
Into Pit	21
Elsewhere on Premises	-
Other	-

Salvaging Practices Observed (53)
None

Remarks (54) *1 - Data not reported.

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II

APPENDIX D
EXHIBIT 12
Page 6 of 7

SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Garberville	4/2/71 (Friday) thru 4/4/71 (Sunday)	144

Vehicle Arrival Time (35)
Range 9:30AM-4:30PM Mode 11:00AM-12:00PM

Unloading Time (36 - 35)
Range 1 - 22 minutes Mean 5.7 minutes Mode 5 - 7 minutes

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	29	28	-	-
Station Wagon	10	8	1	-
Trailer	1	1	-	-
Pick-Up or Light Van	99	82	1	-
Heavy Truck	4	3	1	-
Refuse Vehicle	2	-	1	1
Other				

Vehicle Driver Summary

Age Distribution (40)

	Total	16 - 35	36 - 55	55+
M	126	31	69	26
F	18	7	11	-

Vehicle Passengers/Helpers Summary

Age Distribution (42)

	Total	0 - 9	10 - 15	16 - 35	36 - 55	55+
M	51	21	12	13	3	2
F	58	14	10	18	11	5

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	59	25	40	30	5
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	61	55	35	8	2
Medium (24" x 24" x 24")	13	65	35	-	-
Large (36" x 36" x 36")	6	60	15	25	-
Steel/Plastic Containers					
20 Gal. or Less	77	85	10	5	-
30 Gal.	50	75	25	-	-
50 Gal.	5	60	-	40	-
Sacks	59	80	15	5	-
Other					

Miscellaneous Wastes Summary (49)

Dead animals (2), bicycles (2), old beds (4), stoves (2), chairs, lamps, cardboard, lumber, and miscellaneous bulky items.

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)

Total 31.2 Per Vehicle 0.22

Unloading Procedures Reported (51)

Direct From Vehicle	46
Lift and Carry	106
Drag or Push on Ground	1
Other	-

Final Disposition Summary (52)

On Edge	8
Into Pit	145
Elsewhere on Premises	
Other	

Salvaging Practices Observed (53)

One individual salvaged a chair.

Remarks (54)

COUNTY OF HUMBOLDT
DEPARTMENT OF PUBLIC WORKS

SOLID WASTE DISPOSAL BY
CONTAINERIZATION - PHASE II
APPENDIX D
EXHIBIT 12
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SUMMARY

FIELD SURVEY REPORT - PUBLIC USAGE STUDIES

Name of Site (31)	Date(s) of Survey (32)	Total Vehicle Usage (33)
Summary (five sites)	4/2/71 (Friday) thru 4/4/71 (Sunday)	92

Vehicle Arrival Time (35)
Range 9:30AM-4:15PM Mode 11:00AM-12:00PM

Unloading Time (36 - 35)
Range 1 - 25 minutes Mean 7.3 minutes Mode 5 - 7 minutes

Vehicle Analysis

Type	Total (37)	Ownership Distribution (38) Public	Commercial	Gov't.
Sedan	20	19	1	-
Station Wagon	5	4		
Trailer	1	1		
Pick-Up or Light Van	61	55	1	2
Heavy Truck	4	3	1	
Refuse Vehicle				
Other School Bus	1			1
Motorcycle	1	1		

Vehicle Driver Summary

	Total	Age Distribution (40) 16 - 35	36 - 55	55+
M	70	36	26	8
F	22	13	8	1

Vehicle Passengers/Helpers Summary

	Total	Age Distribution (42) 0 - 9	10 - 15	16 - 35	36 - 55	55+
M	65	20	16	23	4	2
F	38	13	5	14	5	1

Household Wastes Analysis

Type of Containers (43)	Total (44)	Type of Waste Observed (%) Garbage (45)	Refuse (46)	Yard Waste (47)	Ashes (48)
Loose	22				
Cardboard/Wooden Boxes					
Small (12" x 12" x 12")	37	55	40	5	-
Medium (24" x 24" x 24")	17	45	50	5	-
Large (36" x 36" x 36")	13	55	40	(--5--)	
Steel/Plastic Containers					
20 Gal. or Less	32	65	30	5	-
30 Gal.	19	65	30	5	-
50 Gal.	14	40	50	(--10--)	
Sacks	46	65	35	-	-
Other	-				

Miscellaneous Wastes Summary (49)
(see individual summaries)

Estimated Volume of Waste Material Excluding Loose Material (cu. yds.)

Total 31.2 Per Vehicle 0.34

Unloading Procedures Reported (51)	
Direct From Vehicle	50
Lift and Carry	46
Drag or Push on Ground	2
Other	-

Final Disposition Summary (52)	
On Edge	7
Into Pit	91
Elsewhere on Premises	-
Other	-

Salvaging Practices Observed (53)
(see individual summaries)

Remarks (54)

APPENDIX D
EXHIBIT 13
Page 1 of 1

SUMMARY SHEET 8
TRAFFIC SURVEY

METER TIME/METER COUNT

TIME INTERVAL	RURAL DUMP SITE AT				CENTRAL DUMP SITE AT	TOTAL TRAFFIC AT RURAL DUMP SITES (4)
	Blocksburg	Fruitland	Petrolia-Honeydew	Thorn	Garberville	
3/8/71 - 3/9/71 (Monday) (Tuesday)	1:00PM-11:30AM 8	--------	--------	--------	2:45PM-12:15PM 70	8
3/9/71 - 3/12/71 (Tuesday) (Friday)	11:30AM-10:15AM 23	10:00AM- 9:30AM 12	2:15PM- 1:15PM 24	1:00PM-11:45AM 34	12:15PM-11:15AM 103	93
3/12/71 - 3/15/71 (Friday) (Monday)	10:15AM-10:15AM 40	9:30AM- 9:45AM 34	1:15PM- 1:30PM 50	11:45AM-12:15PM 43	11:15AM-11:15AM 199	167
3/15/71 - 3/19/71 (Monday) (Friday)	10:15AM-10:00AM 132 *1	9:45AM- 9:15AM 107	1:30PM-12:45PM 27	--------	11:15AM-11:00AM 212	266
3/19/71 - 3/25/71 (Friday) (Thursday)	10:00AM-10:45AM 51	9:15AM- 9:45AM 100	12:45PM- 2:00PM 24	11:30AM-12:40PM 102	11:00AM-11:40AM 431	277
3/25/71 - 4/5/71 (Thursday) (Monday)	10:45AM-10:25AM 88	9:45AM- 9:35AM 135	2:00PM- 2:00PM 151	12:40PM-12:30PM 185 *2	11:40AM-11:10AM 236	559
4/5/71 - 4/23/71 (Monday) (Friday)	10:25AM-11:25AM 147	9:35AM-10:30AM 221	2:00PM- 2:20PM 227	12:30PM- 1:10PM 233	--------	828
4/23/71 - 4/26/71 (Friday) (Monday)	--------	--------	2:20PM-12:20PM 50	1:10PM-11:00AM 50	12:20PM- 1:00PM 205	100
TOTAL TRAFFIC PER SITE	489	609	553	647	1,456	2,298

Notes: *1 - Possible error due to County maintenance crew cleaning site.

*2 - Hose disconnected on East counter, figure too high.

TRANSFER SEQUENCE

40 Cubic Yard Drop Box

Type A

Sequence Number	Operation
1	Enter site at truck entrance position (P) -1.
2	Pull forward to P-2.
3	Back up to P-3.
4	Pull forward to P-4 and unload empty drop box.
5	Pull forward to P-1.
6	Back up to P-6 and pick up full drop box.
7	Pull forward to P-5.
8	Back up to P-2.
9	Pull forward to P-3.
10	Back up to P-5.
11	Pull forward to P-4 and engage empty drop box lifting front end of box 2 to 3 inches.
12	Back up to P-1 pulling empty drop box on rear rollers.
13	Pull forward to P-6 pushing and guiding empty drop box into stall.
14	Disengage drop box and back up to P-5.
15	Pull forward to P-2.
16	Back up to P-3.
17	Pull forward to P-1 and leave site.

TRANSFER SEQUENCE

40 Cubic Yard Drop Box

Type D and B
(Full container in stall A)

Sequence Number	Operation
1	Enter site at truck entrance position (P) -1.
2	Pull forward to P-2.
3	Back up to P-3.
4	Pull forward to P-1.
5	Back up to P-5 and unload empty drop box into stall B.
6	Pull forward to P-1.
7	Back up to P-2.
8	Pull forward to P-3.
9	Back up to P-4 and load full drop box from stall A.
10	Pull forward to P-3.
11	Back up to P-2.
12	Pull forward to P-1 and leave site.

Type D and B
(Full container in stall B)

Sequence Number	Operation
1	Enter site at truck entrance position (P) -1.
2	Pull forward to P-3.
3	Back up to P-4 and unload empty drop box into stall A.
4	Pull forward to P-3.
5	Back up to P-2.
6	Pull forward to P-1.
7	Back up to P-5 and load full drop box from stall B.
8	Pull forward to P-1 and leave site.

TRANSFER SEQUENCE

40 Cubic Yard Drop Box

Type C
(Full container in stall A)

Sequence Number	Operation
1	Enter site at truck entrance, position (P) -1.
2	Pull forward to P-2.
3	Back up to P-3.
4	Pull forward to P-4 and engage full drop box in stall A, lifting front of box 2 to 3 inches.
5	Back up to P-5 and disengage full drop box.
6	Back up to P-3.
7	Pull forward to P-1.
8	Back up to P-6 and unload empty drop box into stall B.
9	Pull forward to P-1.
10	Back up to P-2.
11	Pull forward to P-6.
12	Back up to P-5 and load full drop box.
13	Pull forward to P-3.
14	Back up to P-2.
15	Pull forward to P-1 and leave site.

TRANSFER SEQUENCE

40 Cubic Yard Drop Box

Type C
(Full container in stall B)

Sequence Number	Operation
1	Enter site at truck entrance, position (P) -1.
2	Pull forward to P-6 and engage full drop box in stall B, lifting front of box 2 to 3 inches.
3	Back up to P-7 and disengage full drop box.
4	Back up to P-1.
5	Pull forward to P-3.
6	Back up to P-4 and unload empty drop box into stall A.
7	Pull forward to P-3.
8	Back up to P-2.
9	Pull forward to P-1.
10	Back up to P-7 and load full drop box.
11	Pull forward to P-1 and leave site.